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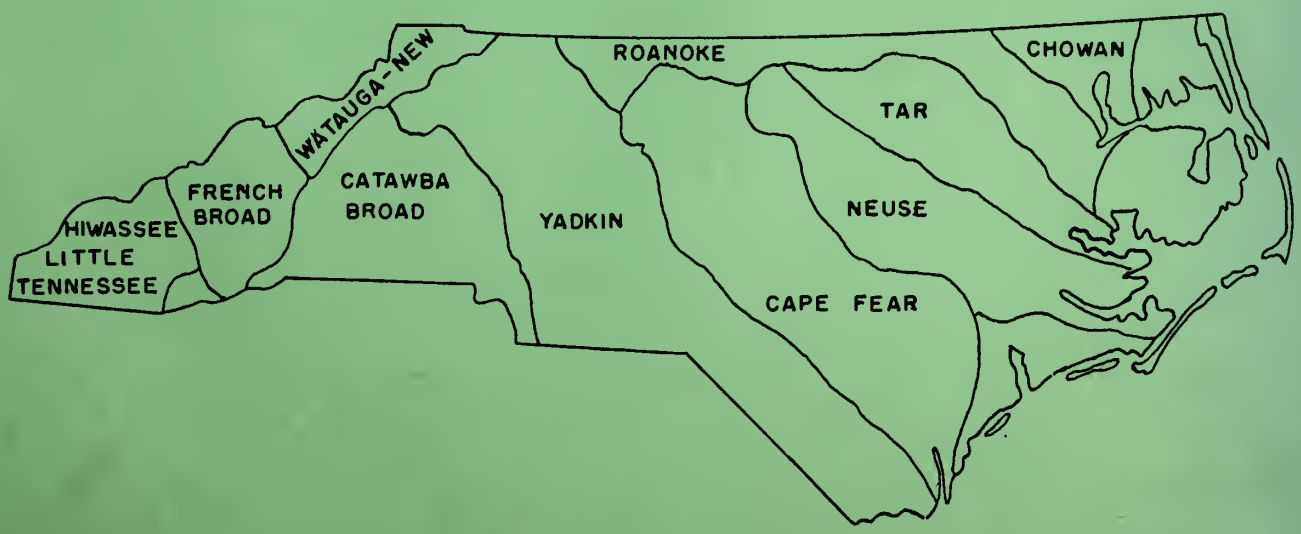
WATER RESOURCES OF NORTH CAROLINA COASTAL PLAIN RIVER BASINS



RALEIGH
1959

FOREWORD

This publication comprises Volume XII of a series of twelve volumes containing information regarding water resources of North Carolina. Volumes I to XI were published as follows:

I State as a whole, January 1955
II Neuse River Basin, May 1955
III Yadkin-Pee Dee River Basin, August 1955
IV Chowan River Basin, December 1955
V Roanoke River Basin, February 1957
VI French Broad River, November 1957
VII Cape Fear River Basin, September 1958
VIII Broad and Catawba River Basins, October 1958
IX Tar-Pamlico River Basin, November 1958
X Hiwassee and Little Tennessee River Basins, December 1958
XI Kanawha and Watauga River Basins, January, 1959

An inventory of water resources of North Carolina was authorized, and funds therefor were allocated, by the Council of State, on October 11, 1954, upon recommendations, approved by the Governor, of the Advisory Water Resources Committee. This Committee was established by the Governor, pursuant to a resolution adopted by the Board of Conservation and Development at its meeting in Raleigh in January 1954, calling for an up-to-date Water Code for the State, and for the conservation and wiser utilization of North Carolina's water resources, and also calling on the Governor to appoint an advisory water committee of seven men to work with the Board's Committee on Water Resources, Inlets and Coastal Waterways in formulating such a program as called for in the resolution. The first five volumes of the inventory were published in accordance with the authorization and allocation indicated above. An act of the 1957 General Assembly assigned to the Board of Conservation and Development the duty of preparing and maintaining a general inventory of the water resources of the State.

Information pertaining to the water resources of the entire State is now available to assist in the orderly planning and development of the water facilities required for municipal and industrial expansion and for expansion of the uses of water for agriculture, and to guide watershed authorities, basin associations, soil conservation districts, and other agencies concerned with water uses in accomplishing their purposes.

It is hoped that this publication will assist in the location, development, and expansion of the municipal, agricultural, and other water supplies, and serve as a guide to the future study of water resources in the Coastal Plain River Basins.

Grateful appreciation is hereby extended to persons who provided material for this volume as follows:

Chapter I - Almanac Publishing Company, Raleigh, North Carolina
Chapter II - Geological Survey, U. S. Department of the Interior
Chapter III - Almanac Publishing Company, Raleigh, North Carolina
Chapter IV - Almanac Publishing Company and National Park Service, U. S. Department of the Interior
Chapter V - Geological Survey, U. S. Department of the Interior
Chapter VI - Geological Survey, U. S. Department of the Interior
Chapter VII - Geological Survey, U. S. Department of the Interior
Chapter VIII - North Carolina State Stream Sanitation Committee
Chapter IX - Soil Conservation Service, U. S. Department of Agriculture
Chapter X - Corps of Engineers, U. S. Army.

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CHAPTER I - DESCRIPTION OF WATERSHED

Location and Area - The North Carolina Coastal Plain River Basins, included in this publication, comprise all basins in the Coastal Plain other than the Chowan, Roanoke, Tar-Pamlico, Neuse, Cape Fear, and Yadkin-Pee Dee River Basins. They include the North (Camden and Currituck Counties), North (Carteret County), Pasquotank, Little, Perquimans, Yeopim, Scuppernong, Alligator, Northport, White Oak, New, Lockwoods Folly and Shallotte River Basins.

Main Streams - North River (Camden and Currituck Counties) is formed by the confluence of Indiantown, Bullfrog, and East Creeks about 12 miles northeast of Elizabeth City, Pasquotank County. It flows south and southeasterly to its confluence with Albemarle Sound about 21 miles southeast of Elizabeth City. Indiantown Creek and North River comprise most of the Camden-Currituck County line and include part of the channel of the Atlantic Intracoastal Waterway between Norfolk and St. Johns River, Florida, via Currituck Sound.

North River (Carteret County) rises about 9.5 miles northeast of Beaufort and flows south to its confluence with Back Sound about 4.5 miles southeast of Beaufort.

Pasquotank River rises on the Camden-Pasquotank County line about 18 miles northwest of Elizabeth City, flows southeasterly to its confluence with Albemarle Sound about 14 miles southeast of Elizabeth City, and includes part of the channel of the Atlantic Intracoastal Waterway between Norfolk and Johns River, Florida, via Dismal Swamp Canal. It forms the Camden-Pasquotank County line during its entire flow.

Little River rises in the Dismal Swamp, Pasquotank County, about nine miles northwest of Elizabeth City, flows southeasterly to its confluence with Albemarle Sound about 11.5 miles south of Elizabeth City, and forms part of the Perquimans-Pasquotank County line. For purposes of this publication, the Little River Basin will be included in the Pasquotank River Basin.

Perquimans River rises in Perquimans County, near the Gates-Perquimans County line, about 12 miles north of Hertford, Perquimans County, and flows southeast, southwest, south and southeast to its confluence with Albemarle Sound about 12.5 miles southeast of Hertford.

Yeopim River rises in Perquimans County about five miles southwest of Hertford and flows southeasterly to its confluence with Albemarle Sound about 8.5 miles southeast of Hertford. Yeopim River and its tributary, Burnt Mill Creek, form part of the Chowan-Perquimans County line. For purposes of this publication, the Yeopim River Basin will be included in the Perquimans River Basin.

Scuppernong River rises in Washington County about 17.5 miles east of Plymouth, and flows southeast, east, northeast, north, and northwest to its confluence with Albemarle Sound, about 24.5 miles northeast of Plymouth and about seven miles southeast of the mouth of Roanoke River. Its principal tributaries are Lake Phelps and six drainage canals connecting Lake Phelps and Scuppernong River. The river and Transportation Canal, one of the six drainage canals, form part of the Tyrrell-Washington County line.

Alligator River rises in Hyde County about 12 miles north of Swanquarter, county seat of Hyde County, and flows east, northeast, north, east,

and north to its confluence with Albemarle Sound about 15.5 miles east of Columbia, county seat of Tyrrell County, five river miles upstream from the mouth of Scuppernong River. Alligator Lake, the principal source of Alligator River, is connected to the river by New Lake Fork. This stream and Alligator River form a part of the Tyrrell-Hyde County line, and Alligator River forms the entire Tyrrell-Dare County line. Alligator River includes a channel of the Atlantic Intracoastal Waterway between Norfolk and St. Johns, Florida, and a land cut of this waterway connects Alligator River and Pungo River.

Newport River rises in Carteret County about 16.5 miles northwest of Morehead City and flows east and south to its confluence with Bogue Sound below the U. S. Highway 70 bridge between Morehead City and Beaufort. Its lower reaches include a channel of the Atlantic Intracoastal Waterway between Norfolk and St. Johns River, Florida.

White Oak River rises on the Jones-Onslow County line, and flows east and southeast to its confluence with Bogue Sound about 22 miles west of Morehead City. During its entire flow, it forms the Jones-Onslow County line.

New River rises in Jones County near the Jones-Onslow County line and flows southeasterly to its confluence with the Atlantic Ocean at New River Inlet about 16 miles south of Jacksonville, county seat of Onslow County. Most of the New River Basin, south of Jacksonville, and a considerable area in the southwestern part of the White Oak River Basin, are included in the New River Marine Base. The Atlantic Intracoastal Waterway between Norfolk and the St. Johns River, Florida, is located along the southern boundaries of these two basins.

Lockwoods Folly River is formed, in Brunswick County, by the confluence of River Swamp and Middle Swamp Creek about 12 miles north of Southport, county seat. It flows west and south to its confluence with the Atlantic Ocean at Lockwoods Folly Inlet about 12 miles west of Southport.

Shallotte River rises in Brunswick County about six miles from the North Carolina-South Carolina State line and flows east and south to its confluence with the Atlantic Ocean at Shallotte Inlet about 8.5 miles west of Lockwoods Folly Inlet. The Atlantic Intracoastal Waterway between Norfolk and St. Johns River, Florida, is located along the southern boundaries of the Lockwoods Folly and Shallotte River Basins.

Topography and Geology - The Coastal Plain slopes, from an elevation of approximately 300 feet at the "Fall Zone" separating the Piedmont Plateau and the Coastal Plain and passing through or near Weldon, Rocky Mount, Wilson, Smithfield, Fayetteville, Raeford, and Rockingham, to sea level at the coast. Its topography is generally level except for some hills near the border of the Piedmont Plateau. Swamps occur in numerous places in the Coastal Plain. The area of the Coastal Plain is composed of a layer of Pliocene and Pleistocene sands and gravels, generally unconsolidated and 10 to 15 feet thick. Under these sands and gravels, there are an unconformable series of Cretaceous and Tertiary sediments, underlain by Pre-Cambrian crystalline rocks, varying in depth from a few feet at the "Fall Line" to 2,000 - 2,500 feet at the coast.

Cover, Climate, Industry, and Agriculture - Information regarding these subjects, pertaining to the Coastal Plain River Basins, may be found hereinafter in this chapter under "General Information regarding Counties".

Population - The populations of incorporated communities located in the

Coastal Plain River Basins, which are included in this publication, are shown below.

Community	County	Population (1940)	Population (1950)
		Population over 10,000	
Elizabeth City	Pasquotank	11,564	12,685
		Population 2,500 to 10,000	
Beaufort	Carteret	3,272	3,212
Morehead City	Carteret	3,695	5,144
		Population less than 2,000	
Atlantic	Carteret	711	844
Bolivia	Brunswick	203	215
Cherry	Washington	108	73
Columbia	Tyrrell	1,090	1,161
Creswell	Washington	459	425
Hertford	Perquimans	1,959	2,096
Jacksonville	Onslow	873	3,960
Manteo	Dare	571	635
Newport	Carteret	480	676
Richlands	Onslow	688	877
Roper	Washington	716	793
Shallotte	Brunswick	381	493
Swansboro	Onslow	454	559

Populations of counties in the basins are indicated hereinafter in this chapter under "General Information regarding Counties".

Counties included in the Coastal Plain River Basins - Counties which lie within or partially within these basins are as follows:

North River Basin - Currituck and Camden.
Pasquotank and Little River Basins - Camden, Pasquotank, and Perquimans.
Perquimans and Yeopim River Basins - Perquimans and Chowan.
Scuppernong River Basin - Washington and Tyrrell.
Alligator River Basin - Tyrrell, Hyde, and Dare.
North River Basin - Carteret.
Newport River Basin - Carteret and Craven.
White Oak River Basin - Carteret, Jones, Craven, and Onslow.
New River Basin - Jones and Onslow.
Lockwoods Folly River Basin - Brunswick.
Shallotte River Basin - Brunswick.

General Information regarding Counties

Brunswick County - This county was formed in 1764 from New Hanover and Bladen Counties, and was named in honor of the hereditary Prince of Brunswick. It was first settled in 1664 by Barbadians. Their colony was abandoned. The first permanent settlement occurred about 1725. The first seat of colonial government was at the ancient town of Brunswick which has vanished except for the ruins of St. Phillips Church and graveyard. Brunswick County is rich in historical lore of the Colonial, Revolutionary, and Civil War periods.

Brunswick is the most southeasterly county in North Carolina and borders on the Atlantic Ocean and South Carolina. Its land is low and swampy. Much of the forests is in large tracts held by Riegel Paper Company and

International Paper Company. Second-growth pine is coming back rapidly. Waters include Cape Fear, Waccamaw, Shallotte, Lockwoods Folly, and Elizabeth Rivers; numerous creeks; and several swamps. The Atlantic Intracoastal Waterway extends, in Brunswick County, from Southport to the North Carolina-South Carolina State line at Little River Inlet.

A very small percentage of the land is in cultivation, and potatoes, corn, and tobacco are the chief crops, though flowers, truck crops, small grains, tomatoes, blue berries, and early plants for later transplanting are being introduced. Lumbering is the chief occupation in terms of employment. Southport is one of the leading shipping-points for shrimp, clams, and other food fish. It is also a center for the menhaden fleet.

Points of interest include ruins of old Brunswick and ancient churchyard, of which only the thick brick-walls of St. Phillips Church and cemetery survive; Orton Plantation including camellia and azalea gardens, which attract large crowds in early spring, particularly during the annual Azalea Festival at Wilmington and the mansion which is considered the most beautiful home (antebellum architecture) surviving in North Carolina; Fort Johnson at Southport, the oldest fort remaining in North Carolina; and Baldhead (Smith) Island, a subtropical area which has an excellent beach and is heavily forested with palmetto and other trees, and at the southern extremity of which are located New and Old (abandoned) Cape Fear Lighthouses.

Communities include Southport (county seat), Shallotte, Winnabow, Bolivia, Leland and Supply.

Rainfall (inches)	49.03
Snowfall (inches)	1.8
Mean annual temperature (degrees)	63.4
Growing season (days)	245
Tobacco (1951 Val.)	$3,250,000
Corn (1951 Val.)	$497,950
Hay (1951 Val.)	$211,240
Total Land Area (acres)	558,720
Forest Area (acres)	427,200
Population (1940)	17,125
Population (1950)	19,238
Total Tax Val.	$14,356,103
Tax Rate	$1.80

Camden County - This county was created in 1777 from Pasquotank County and was named for Charles Pratt, Earl of Camden, who advocated repeal of the Stamp Act. The Weapomeick Indians, whose chief town was in the present Pasquotank County, once ruled this area.

Camden County is located in the northeastern section and is one of the smallest counties in the State. It borders on Virginia, and much of its area is flat, swampy land. The Great Dismal Swamp occupies the northern area and contains about 750 square miles. Nearly 75 percent of the acreage of the county is in forests, and the chief merchantable-species of timber are long-leaf pine; gum, juniper, and white cedar. The county is bordered on the east by North River, on the west by Pasquotank River, and on the south by Albemarle Sound. The Atlantic Intracoastal Waterway between Norfolk and Albemarle Sound has two routes, one via Pasquotank River and Dismal Swamp Canal and the other via North River and Currituck Sound. The section of the former route, crossing Camden County between Pasquotank River and Virginia, is known as Drummond Canal.

Corn is the main crop in Camden County, with Irish potatoes and soybeans next in importance. Potatoes and other field crops provide 65 percent of farm income. The county is one of the principal areas in the State for cabbage and, in recent years, soybeans have come into prominence. Lumbering and fishing are important.

Points of interest include the site of the Halfway House on the Virginia-North Carolina State line, half in each state; Sawyer's Lane Battlefield (Civil War) near South Mills, where breastworks and trenches still remain; Courthouse at Camden built in 1847; the Enoch Sawyer House near Camden (1746) believed to have been used as a hospital and refuge during the Civil War; Fairfax Hall (built about 1700), home of Brigadier General Isaac Gregory who led the North Carolina brigade at the Battle of Camden in 1780; and Shiloh Baptist Church, oldest organized Baptist church in the State, which was used as a Federal arsenal during the Civil War.

Communities include Camden (county seat), Shiloh, Old Trap, South Mills, Riddle, Belcross, and Indian Town.

Rainfall (inches)	48.5
Snowfall (inches)	5.6
Mean annual temperature (degrees)	60.8
Growing season (days)	214
Irish and Sweet Potatoes (1952 Val.)	$766,400
Corn (1952 Val.)	$1,229,100
Soybeans (1952 Val.)	$820,985
Total Land Area (acres)	152,960
Forest Area (acres)	85,100
Population (1940)	5,440
Population (1950)	5,223
Total Tax Val.	$4,247,555
Tax Rate	$1.75

Carteret County - This county was created in 1722 out of Bath County and named in honor of Lord Carteret of Hawnes, a Lord Proprietor. This section was believed to have been settled as early as 1700. The Town of Beaufort was captured by Spaniards in 1747, but was relieved in a few days by armed citizens. During the Civil War, Federal troops under General Burnside took Fort Macon, now a State Park.

A central coastal county, Carteret is low, often swampy. Its mainland lies behind narrow sounds (Bogue, Back, and Core Sounds), formed by a barrier reef which projects out toward the Gulf Stream to form Cape Lookout. Lookout Bight, north of Cape Lookout, is protected by a breakwater and provides a harbor large enough to hold all the fleets of the world. The county is a large forest area, much of which is in Croatan National Forest. Waters include Neuse, Newport, and North Rivers, several creeks, and Back, Bogue, Core, and Pamlico Sounds.

Tobacco is the chief crop, followed by Irish and sweet potatoes and corn. Cultivation of flowers, on a commercial scale, has proven successful. The county has the State's most active commercial-fishing industry. Menhaden fishing boats are based at Morehead City and Beaufort. They bring their catches to eight plants in the county which process them into fish oil, meal, and scrap used in the manufacture of fertilizer. The fishing operation for food fish is scattered from Bogue Inlet to Portsmouth near Ocracoke Inlet. Other industries all relatively small, are boat-building, textiles, and lumbering. The tourist business is important.

Morehead City Technical Institute, a branch of North Carolina State College, offers courses to men interested in a marine profession. The Duke University Marine Summer School and the U. S. Marine Biological Laboratory and Museum are located at Pivers Island between Morehead City and Beaufort. Woman's College Summer Marine and Art Schools are at Beaufort.

Points of interest at Morehead City are the State Ports Authority's terminal, yacht basin, marina, menhaden-processing plants, heron rookery (difficult of access), and boat-building yards. Points of interest at Beaufort include the Dr. Cramer House, the Davis House, Thomas Duncan House, and Ernest Duncan House. Atlantic Beach and Fort Macon State Park are at the eastern end of Bogue Banks and are reached by a bridge from Morehead City across Bogue Sound. Pony pennings, for branding the colts, are held each summer on Core Banks between Cape Lookout and Drum Inlet.

Communities include Beaufort (county seat), Morehead City, Harkers Island, Atlantic, Marshallberg, Davis, Newport, Sealevel, Otway, Stacey, Salter Path, Merrimon, Williston, Roe, Bettie, Lukens, Smyrna, Wildwood, and Camp Glen (N. C. National Guard).

Rainfall (inches)	53.26
Snowfall (inches)	1.3
Mean annual temperature (degrees)	64.0
Growing Season (days)	269
Tobacco (1951 Val.)	$1,393,120
Irish and Sweet Potatoes (1951 Val.)	$450,780
Corn (1951 Val.)	$194,780
Total Land Area (acres)	340,480
Forest Area (acres)	273,000
Population (1940)	18,284
Population (1950)	23,059
Total Tax Val.	$21,058,938

Chowan County - This county was created in 1672 out of Albemarle County and was named for an Indian tribe which originally occupied the area. Edenton (county seat) was settled as early as 1658 and is one of the oldest communities in the State. Old records indicate it as the Customs Port of the Albemarle District. By 1710, it was the capital of the Colony and residence of the Governor. It was known as Queen's Town. In 1722, its name was changed to Edenton in honor of Royal Governor Charles Eden. The first Revolutionary Tea Party, in protest of the British Tax, was held at Edenton in 1774. Noted men of Edenton include Joseph Hewes, one of the State's three signers of the Declaration of Independence.

Chowan County is located in the northeast Coastal area of the State and has considerable land along the Chowan River. Merchantable timber is loblolly pine, tupelo, and black gum. Waters include Chowan River, Yeopim River, and Burnt Mill, Rockyhock, Dillard, and smaller creeks.

Edenton is the largest peanut-market in North Carolina and the second largest in the world. Other crops are cotton, corn, soybeans, tobacco, cantaloupes, and watermelons. The shad and herring-fisheries have played an important part in Edenton's economy since its earliest days. Now, the processing of these fish has been developed as an important local-industry with canning and packing plants. There are, in addition to these industries, storage warehouses, peanut plants, textile mills which make Edenton the cotton-yarn center of northeastern North Carolina, lumber and veneer mills, and fertilizer plants.

A Marine Corps Air Station is located at Edenton.

Points of interest are as follows:

St Paul's Church (1736), Edenton, second oldest church in North Carolina, which has been restored after being partially burned. The vestry of the church, organized in 1701, was the first religious body in the State. There are buried, in the churchyard, three Proprietary Governors and other persons prominent in Colonial Times.

Also in Edenton, the Courthouse (1767), the Joseph Hewes House (1750), George Washington's Chair in the lodge room of Unanimity Lodge No. 7, Beverly Hall (1810), The Cupola House (1712), and Hayes Plantation (private).

The stately mansion situated on Edenton Bay built in 1801 by Samuel Johnston, Governor and first U. S. Senator from North Carolina.

Bandon Plantation in the upper part of Chowan County.

Sites of old plantations along the shores of the Chowan River.

Communities include Edenton (county seat), Center Hill, Rockyhock, Ryland, Icaria, Cisco, Gliden, Tyner, Crossroads, and Yeopim.

Rainfall (inches)	50.77
Snowfall (inches)	7.6
Mean annual temperature (degrees)	60.6
Growing season (days)	217
Peanuts (1951 Va.)	$1,664,830
Corn (1951 Val.)	$875,790
Tobacco (1951 Val.)	$546,750
Total Land Area (acres)	115,200
Forest Area (acres)	43,300
Population (1940)	11,572
Population (1950)	12,540
Total Tax Val.	$11,333,518
Tax Rate	$1.53

Craven County - This county was created in 1712 out of Bath County and was named in honor of William, Lord Craven, one of the Lords Proprietors. New Bern, one of the oldest towns in the State, was first settled in 1710 by Swiss and German Palatines under Baron de Graffenried, and was named for the Swiss Capitol, Berne. The settlement was under attack by the Tuscarora Indians for two years; so, in 1713, many of the colonists returned to Europe. The next settlement was made under the leadership of Colonel Thomas Pollock. Sessions of the Colonial Assembly met in New Bern from 1745 to 1761.

In the central Coastal region, Craven is low and sometimes swampy. Marl deposits are found southeast of New Bern, and two brickyards near New Bern use local clays. Chief merchantable timber is loblolly pine, longleaf pine, gum, ash, and poplar. Part of Croatan National Forest is located in the southwestern portion of the county. Waters include Neuse River, Trent River, Long Lake, Great Lake, Ellis Lake, Little Lake and numerous creeks including Hunting Creek, a tributary of White Oak River.

Tobacco is the leading crop. Other crops include cotton, corn, hay, and truck crops. Hogs are an important agricultural factor. New Bern is the center of the agricultural, lumbering, and fishing interests of the region. Among other

industries are fertilizer plants, a chemical plant which has developed an inexpensive method of manufacturing manganese sulfate and copper napthalate, and tobacco stemming and redrying, iron, ceramic, boatwork, and crate-factory plants.

Cherry Point, largest U. S. Marine Corps Air Station in the world, is situated 19 miles southeast of New Bern on the Neuse River. Craven County Farm Life School is located at Vanceboro.

Points of interest are as follows:

New Bern's many old and historic homes and buildings comprising the New Bern Academy, the Masonic Temple Theatre, Tryon's Palace which has been restored, the First Presbyterian Church (1817), Jarvis-Hand House (1803), Louisiana House (1776), John Wright Stanly House (before 1790), Glover-Guion House (1835), and Smallwood-Ward House (between 1812 and 1816).

Fort Barnwell on N. C. Highway about 25 miles northwest of New Bern.

Remains of Fort Amory and graves of three North Carolina Governors near James City on Trent River about two miles south of New Bern.

Communities include New Bern (county seat), Vanceboro, Dover, Bridgeton, James City, Fort Barnwell, Cove City, Clark, Havelock, Croatan, Ernul, Jasper, Neuse Forest, and North Harlows.

Rainfall (inches)	56.15
Snowfall (inches)	3.5
Mean annual temperature (degrees)	62.4
Growing season (days)	227
Tobacco (1951 Val.) est.	$9,700,710
Corn (1951 Val.)	$1,340,440
Hay (1951 Val.)	$159,050
Total Land Area (acres)	464,000
Forest Area (acres)	328,100
Population	31,298
Population (1950)	48,823
Total Tax Val.	$27,438,526
Tax Rate	$1.75

Currituck County - This county was created in 1672 out of Albemarle County and was named for a small band of Indians (Carotank- wild geese), once inhabiting the region. It was visited by Ralph Lane, Sir Walter Raleigh's early explorer.

A northeastern county, Currituck is bounded by Virginia and the Atlantic Ocean. It is low, sandy and swampy in some places. The Dismal Swamp occupies a small area in the northwestern part of the county. Chief merchantable timbers are loblolly pine and gum. Waters include the Atlantic Ocean, Currituck and Albemarle Sounds, North River, Northwest River, North Landing River, and the Atlantic Intracoastal Waterway (land cut between North River and Currituck Sound).

Irish and sweet potatoes, corn, and soybeans are the principal crops. Others include peanuts, watermelons, and snap beans. The raising of livestock is important. The climate is fitted for early commercial-truck production. Commercial and sport fishing are important in the county's economic life. Currituck Sound has the reputation of being the best duck-hunting grounds on the

Atlantic flyway. Catering to hunters in winter and fishermen gives employment to many families. There are only three small industries, one of which is carp fishing. The carp are kept in pools and shipped alive in tank cars.

Points of interest include Currituck Lighthouse at Corolla, Twin House at Shawboro, Courthouse (1876) at Currituck, birthplace of Governor Thomas Jarvis (1879-84) at Jarvisburg, and Wright Memorial Bridge at Point Harbor marking the confluence of Albemarle, Croatan, Currituck, and Roanoke Sounds.

Communities include Currituck, county seat, Jarvisburg, Harbinger, Moyock, Barco, Poplar Branch, Aydlett, Grandy, Shawboro, Mamie, Knotts Island, Gregory, Coinjock, Sea Gull, Woodleigh, Corolla, and Spot.

Rainfall (inches)	42.48
Irish and Sweet Potatoes (1952 Val.)	$697,300
Corn (1952 Val.)	$804,690
Soybeans (1952 Val.)	$571,480
Total Land Area (acres)	174,720
Forest Area (acres)	84,800
Population (1940)	6,709
Population (1950)	6,201
Total Tax Val.	$7,565,868
Tax Rate	$ .85

Dare County - This county was formed in 1870 from Currituck, Tyrrell, and Hyde Counties and was named in honor of Virginia Dare, first English child born in the New World (1587). Three expeditions sent out by Sir Walter Raleigh, the first in 1584, explored the North Carolina Coast, and a settlement was attempted on Roanoke Island. The little colony disappeared mysteriously. Fort Raleigh has been partially restored with blockhouses, cabins, and a museum. At Weir Point, Reginald A. Fessenden conducted early experiments in wireless transmission. The Wright Brothers made the first flight in a powered airplane at Kill Devil Hill in 1903. In peacetime and before perfection of modern navigation-aids, Dare's Coast Guard (or life saving) Stations were the most active in this country.

Because of its unique history, economy, and geographical setting, Dare is one of the most interesting of North Carolina counties. More than 50 percent of its area comprises water. Its mainland portion is largely a wilderness of low, poorly-drained lands. Most of its inhabitants live either on Roanoke Island or on the sandy Outer Banks stretching from Duck to Cape Hatteras. The Gulf Stream is closer to Cape Hatteras than to any other point in North Carolina (14 miles). The forests (mostly on the mainland) contain gum, loblolly pine, pocosin pine, cedar, and cypress trees. Timber on the Outer Banks has disappeared except for some pine woods near Buxton. Waters include Pamlico, Croatan, Roanoke, and Albemarle Sounds, Alligator River, Long Shoal River, East Lake, South Lake, numerous bays, and Broad, Milltail, and other creeks.

Wine-quality grapes, figs, citrus fruits, and cranberries grow well. Corn, livestock, and dairy products are fairly important. Most of employment is in fishing, coast guarding and other government service, catering to tourists and sportsmen, and retail and service trades. Commercial fishing for croaker, trout, mullet, blues, mackerel, spots, and shellfish is important. Dare has recorded the greatest variety of shellfish of any county in the United States. The tourist industry, largely concentrated at Nags Head and other beaches north of Roanoke Island, is of growing importance.

Points of interest include Fort Raleigh on Roanoke Island; Mother Vineyard

Grapevine (scuppernong), a huge vine reputedly planted by Raleigh's Colonists; Kill Devil Hill, site of first powered airplane flight, now a National Monument; Collington Island, fishermen's village; Bodie Island Lighthouse; Cape Hatteras Lighthouse, tallest (195 feet) brick lighthouse in America, which was built in 1870 and has recently been reactivated; Diamond Shoals Lightship; remains of numerous wrecks along the Outer Banks; and Coast Guard stations.

Communities include Manteo (county seat), Wanchese, Hatteras, Buxton, Avon, East Lake, Stumpy Point, Kitty Hawk, Manns Harbor, Rodanthe, Frisco, Collington, Nags Head, Mashoes, Salvo, and Waves.

Rainfall (inches)	48.59
Snowfall (inches)	1.2
Mean annual temperature (degrees)	60.4
Growing season (days)	289
Fruits and nuts sold (1952 Val.)	$90,500
Livestock and Livestock Products Sold (1952 Val)	$18,950
Total Land Area (acres)	248,320
Forest Area (acres)	166,300
Population (1940)	6,041
Population (1950)	5,405
Total Tax Val.	$16,454,242
Tax Rate	$ .90

Hyde County - This county was created in 1705 out of Bath County and was named in honor of Edward Hyde, Governor of North Carolina (1710-12). Swanquarter, settled in 1812, was named for the thousands of swans that used the bay as a winter haven. The Village of Ocracoke was settled in the 17th century and, before 1860, was an important port. Here, Blackbeard (Edward Teach), the dread pirate, caulked his ships at Teach's Hold and met his defeat at the hands of Lieutenant Robert Maynard, who was in command of a Colonial sloop-of-war.

In the eastern Coastal region, Hyde County is low, with swamps covering almost the entire northern portion. Its boundaries include part of the great Outer Banks. The mainland is bordered on the east by Pamlico Sound. Principal merchantable-species of trees are loblolly pine, gum, and cypress. Waters include Pungo and Alligator Rivers; Alligator, Pungo, and Mattamuskeet Lakes; Slade Creek; numerous bays; Pamlico Sound; and the Atlantic Ocean.

Chief cash crops are corn, soybeans, livestock and truck crops, small grain, cotton, and lespedeza. The major industrial operations in the county consist of commercial fishing and processing. Large beds of oysters are in the waters near Swanquarter. Other industries include the packing of seafood, lumbering, and a small tourist trade. Engelhard is a commercial-fishing center. Catering to sportsmen engages a considerable number of people.

Points of interest include the migratory Wildlife Refuge Center including part of West Bluff Bay, Swanquarter Bay, Deep Cove, Deep Bay, and the eastern part of Rose Bay; the Annual Pony Penning on Ocracoke Island in July; and Ocracoke Lighthouse (1798), oldest active lighthouse in the United States, in which no structural changes have been made.

Rainfall (inches)	51.11
Snowfall (inches)	2.6
Mean annual temperature (degrees)	62.0
Growing season (days)	236
Corn (1952 Val.)	$800,000
Soybeans (1952 Val.)	$900,000

Livestock and Livestock Products Sold (1952 Val.)	$350,000
Total Land Area (acres)	405,760
Forest Area (acres)	295,000
Population (1940)	7,860
Population (1950)	6,479
Total Tax Val.	$4,969,404
Tax Rate	$1.80

Jones County - This county was formed in 1778 from Craven County and was named in honor of Willie Jones of Halifax, one of the leading patriots of the Revolution. The first court was held in Trenton in 1784 at the Thomas Webber house which was constructed with pegs.

Lying in the Coastal region, Jones County has a low topography, with much land included in Great Dover, White Oak, and other swamps and pocosins. Marl and shell rock occur along the Trent River, and a great many deposits have been worked for land lime. Chief merchantable-species of trees are loblolly pine, gum, longleaf pine, poplar, ash, and cypress. Waters include Trent and White Oak Rivers (both navigable), Tuckahoe Swamp and Beaver, Hunter, and other creeks including Black Swamp Creek, a tributary of White Oak River.

Tobacco is the leading cash-crop. Corn is also an important source of income. Livestock raising and dairying are increasing. Other crops include sweet and Irish potatoes, truck crops, hay, and small grains. Lumbering is virtually the only industry in the county.

Points of interest include Old Shingle House at Trenton, a colonial tavern visited by George Washington in 1791; McKinney Lake Hatchery; Hoffman Nursery, and Pine Forest Game Farm in Hoffman Forest, declared to be the largest forest-demonstration area in the United States; and an old mill on a pond at Trenton.

Communities include Trenton (county seat), Comfort, Maysville, Pollocksville, Phillips, Foys, and Winsatt.

Rainfall (inches)	56.15
Snowfall (inches)	3.5
Mean annual temperature (degrees)	62.5
Growing season (days)	227
Tobacco (1952)	$6,274,064
Corn (1952)	$1,725,000
Livestock Sold (1952) est.	$601,000
Total Land Area (acres)	298,880
Forest Area (acres)	200,500
Population (1940)	10,926
Population (1950)	11,004
Total Tax Val.	$6,539,690
Tax Rate	$2.05

Onslow County - Onslow County was formed in 1734 from Bath County and was named in honor of Arthur Onslow, for more than thirty years Speaker of the House of Commons in the British Parliament. The English and German settlers were harassed by the Spanish buccaneers in the 1740's. There are records, as early as 1757, of Jacksonville, formerly Wantland's Village, which, until the war boom, was a sleepy village.

In the eastern Coastal region, Onslow is one of the few counties in the State which has a mainland beach on the ocean, although the Atlantic Intracoastal

Waterway now intervenes. The topography is low and level, and Holly Shelter and White Oak pocosins extend into the southern and northern parts of the county, covering much of the acreage. Chief merchantable species of trees are loblolly pine, gum, and mixed pine. Waters include New River and White Oak River; Juniper, Shelter, and Sandy Run Swamps; Southwest, Queens, and other creeks; Onslow Bay; and the Atlantic Ocean.

Tobacco is the leading cash-crop. Other crops grown are corn, peanuts (grown chiefly for feed for hogs), hay, Irish and sweet potatoes, soybeans, and oats. Onslow hams are widely known for their excellence. The county is noted for its cultivated bed of New River oysters and, although these are produced on a small scale, they command a high price. There are no large industries. Lumbering is important economically. There is a growing tourist industry in the county which offers excellent hunting and fishing. There is an extensive deposit of shell rock near Belgrade, from which thousands of tons have been removed for highway construction and other purposes. The deposit was laid down by countless generations of shellfish when the sea covered this section.

Points of interest include Camp Davis near Holly Ridge which the Federal Government established during World War II as an Army anti-aircraft base and which has since been abandoned, and New River Marine Base on the New River south of Jacksonville, the largest, permanent all-purpose training base of the U. S. Marine Corps in the world.

Communities include Jacksonville (county seat), Richlands, Swansboro, Silverdale, Folkstone, Dixon, Sneeds Ferry, and Verona.

Rainfall (inches)	57.73
Snowfall (inches)	0.7
Mean annual temperature (degrees)	62.8
Growing season (days)	248
Tobacco (1951 Val.)	$7,345,710
Corn (1951 Val.)	$1,196,800
Hay (1951 Val.)	$122,450
Total Land Area (acres)	483,840
Forest Area (acres)	366,600
Population (1940)	17,939
Population (1950)	42,047
Total Tax Val. (1952)	$22,945,506
Tax Rate	$1.33

Pasquotank County - This county was formed in 1672 from Albemarle County. It was settled early in the history of the State and was named for a minor Indian tribe. For a while, the waters around the county were the haunts of the pirate, Blackbeard. As early as 1722, trading vessels called at the port which was incorporated as Elizabeth Town in 1793. The town was apparently named for a tavern keeper's daughter. West Indies trade made the port a thriving business-center, where Negro slaves unleaded cargoes of molasses, rum, sugar, and tropical fruits. The first legislative-assembly in North Carolina was held in 1665 in this area. Also the first school (Charles Griffin, teacher) was established here.

Lying in the northeast Coastal region, Pasquotank County has a fertile soil. The Great Dismal Swamp extends through the northern part of the county. Chief merchantable-species of timber are loblolly pine, gum, and oak. Waters include Pasquotank and Little Rivers; Knobb's, Newbegun, Big Flatty, Little Flatty, and Symonds Creeks; and Albemarle Sound.

Chief farm-products are livestock, corn, cotton, and soybeans, in addition

to Irish and sweet potatoes and other truck crops. Besides retail trade and shipping, enterprises include lumber, cotton, hosiery, and veneer mills. There is a substantial shipyard for small craft. Elizabeth City is strategically situated on the banks of the Pasquotank River and is one of the largest fish-marketing centers of the southern United States. During World War II, Elizabeth City and Weeksville were important Coast Guard centers, with a blimp patrol.

The State Normal School for Negroes, near Elizabeth City, offers a four-year training course.

Elizabeth City was the home of the late Governor John C. B. Ehringhaus. The house, in which he was born, is now used as the Woman's Club.

Points of interest are the Pasquotank County Courthouse which holds deed books which date from 1700; the Fearing House, oldest residence in Elizabeth City, which was built about 1740 by one of the town's founders; the Pasquotank River Yacht Club at Elizabeth City; the old Brick House, headquarters for the pirate, Blackbeard, near Elizabeth City; the Great Dismal Swamp about 15 miles from Elizabeth City; Bayside, a plantation house built about 1800, and Enfield Farm, home of Thomas Relfe, erected in 1670, both of which are near Elizabeth City; and the U. S. Nary Lighter-Than-Air Station at Weeksville where there are preservation and storage facilities for several hundred aircraft.

Communities include Elizabeth City (county seat), Weeksville, Okisko, Nixonton, and Morgans.

Rainfall (inches)	48.5
Snowfall (inches)	5.4
Mean annual temperature (degrees)	62.1
Growing season (days)	214
Corn	$1,368,312
Irish Potatoes	$1,700,000
Soybeans	$1,085,175
Total Land Area (acres)	146,560
Forest Area (acres)	64,800
Population (1940)	20,568
Population (1950)	24,347
Total Tax Val. (1952)	$25,150,949
Tax Rate (1952)	$1.22

Perquimans County - This county was formed in 1672 from Albemarle County and was named after a tribe of Indians. The Durant deed, oldest on record in North Carolina, was made in 1661 when George Durant acquired a tract of land from the chief of the Yeopim Indians. Hertford, a port of entry as early as 1701, was incorporated in 1758 and named for the Marquis of Hertford. The courthouse at Hertford (1731), originally a one-story structure, has been restored. The Colonial seat of Governor John Harvey (1679) and Thomas Harvey (1694-99) was at Harvey's Neck. The latter's son, Colonel John Harvey, was known as the Father of the Revolution in North Carolina.

Perquimans, lying in the northeast Coastal region, has a low, fertile sandy topography with swamps lying along the broad and beautiful Perquimans River. Principal merchantable-species of trees are loblolly pine, gum, and oak. Waters include Perquimans, Yeopim, and Little Rivers; Sutton's, Gooding's Mill, Burnt Mill, and Yeopim Creeks; and Goodwin's Millpond.

Chief cash crops are peanuts and corn. Livestock raising is also im-

portant. Truck farming is good, May peas being a valuable crop. Other crops grown are cotton, hay, Irish and sweet potatoes, oats, tobacco, wheat, and lespedeza. Lumbering and fishing are the only industrial operations in the county with the exception of a cotton oil plant and a shirt factory at Hertford.

Points of interest include, at Hertford, the restored courthouse, site of the Old Eagle Tavern (1754), and the Harvey Home; near New Hope, the Hecklefield Farm, estate of Captain John Hecklefield who was prominent in the affairs of the Albemarle Colony, and the Leigh Mansion (1825) on an estate which includes a major portion of the 1,000-acre Durant grant; and at Belvidere, settled by the Belvidere Academy, one of the State's earliest schools.

Communities include Hertford (county seat), Winfall, Chapanoke, Belvidere, Burgess, Anderson's , Durants Neck, Parkville, and Nicanor.

Rainfall (inches)	50.75
Snowfall (inches)	7.6
Mean annual temperature (degrees)	60.5
Growing season (days)	217
Livestock Sold (1952 Val.) est.	$2,785,000
Corn (1952) est.	$1,065,000
Peanuts (1952) est.	$626,760
Total Land Area (acres)	167,040
Forest Area (acres)	93,100
Population (1940)	9,773
Population (1950)	9,602
Total Tax Val.	$8,170,745
Tax Rate	$1.70

Tyrrell County - This county was part of a land grant to one of the Lords Proprietors, Anthony Ashley Cooper. It was formed in 1729 as a precinct of Albemarle County and was named for Sir John Tyrrell, Lord Proprietor. The ancient town of Columbia, originally a trading post known as Shallops Landing, was named Elizabeth Town and made the county seat, in 1800. The name was later changed to honor Christopher Columbus.

In the northeast Coast region, Tyrrell County's flat, often-swampy lowlands are bounded on the north by Albemarle Sound and on the east by the Alligator River. Its forests, rivers, and marshes abound with game and fish. Principal merchantable-species of trees are loblolly pine, gum, cypress, and white cedar. In addition to Albemarle Sound and Alligator River, waters include Scuppernong, Northwest Fork Alligator, and Southwest Fork Alligator Rivers; Grapevine Bay; Second and Juniper Creeks; and Batava and Bee Tree Canals, two of the six drainage canals which connect Lake Phelps and Scuppernong River. A free ferry, from Sandy Point, in Tyrrell County on the western bank of Alligator River, to East Lake, on the mainland of Dare County and on the eastern bank of Alligator River, connects U. S. Highway 64 in Tyrrell County and U. S. Highway 64 in Dare County.

Irish potatoes, corn, and livestock sold are the chief sources of farm income in Tyrrell County. The principal farming-region is along the higher, northern border, and Columbia (county seat) bustles with activity during the potato season. Other truck crops, including snapbeans, are raised. Lumbering comprises the only industry in the county with operation of about ten sawmills.

Commercial fishing includes shad, herring, striped bass, etc.

Points of interest include Fort Landing, a fishing village on Little

Alligator River believed to be the oldest settlement in Tyrrell County; ferry from Sandy Point to East Lake; the Frying Pan, an indentation of Alligator River, on which, in summer, American lotus float on water; Phelps Lake (Pettigrew State Park), 16,000 acres, which attracts fishermen and boat fans; and the Josiah Collins House on the shore of Phelps Lake, a Civil War plantation.

Communities include Columbia (county seat), Jerry, and Fort Landing.

Rainfall (inches)	51.15
Snowfall (inches)	5.0
Mean annual temperature (degrees)	59.5
Growing season (days)	184
Soybeans (1951 Val.)	$479,590
Corn (1951 Val.)	$392,760
Irish Potatoes (1951 Val.)	$426,240
Total Land Area (acres)	255,360
Forest Area (acres)	221,600
Population (1940)	5,556
Population (1950)	5,048
Total Tax Val.	$4,453,507
Tax Rate	$1.96

Washington County - Washington County was formed in 1799 from Tyrrell County and was named in honor of George Washington. Before the Civil War, Plymouth (county seat), was an important shipping center. By 1865, however, naval battles had reduced the village to eleven scarred buildings. Lake Phelps, almost all of which is in Washington County and only a small part of which is in Tyrrell County, has a State park on the northern shore. Pungo Lake, southwest of Lake Phelps, has very little accessibility. The only road toward Pungo Lake, a county road leading from North Carolina Highway 99, stops at a drainage canal in the eastern part of East Dismal Swamp about 1.5 miles from the western shore of Pungo Lake, which has no outlet other than two drainage canals extending easterly from the lake. A six-mile bridge on N. C. Highway 32, constructed in recent years, has given, to inhabitants of Washington County and others, quick access to the northern shore of Albemarle Sound. Natives still, sometines, make and use primitive, but highly efficient, boats hollowed from a tree trunk.

In the northeastern Coastal area on the southern shore of Albemarle Sound, Washington County is low and sandy, with some fertile, black land. Sixty-five percent of the area is in swampland, and over one-half of the area is in forest. The timber, mostly loblolly pine and gum, grows on the higher or best-drained land. Savanna or pocosin pine is usually found in the swamps. There is no mineral production. Industrialists, in recent years, have been investigating the possibility of recovering ilmenite from black sands in Albemarle Sound for use in paints and pigments. Shell limestone, marl, and clay deposits, suitable for brick-making, occur in the county. Waters include Roanoke and Scuppernong Rivers (both navigable); Welsh, Mackeys, Conaby, Deep, and other creeks; and Lake Phelps and Pungo Lake.

Most of the farming is confined to the northern part of the county. Peanuts, tobacco, soybeans, potatoes, and corn occupy most of the acreage. Important livestock and farming demonstrations are conducted at the Federal-State Tidewater Test Farm, five miles from Plymouth. There is some commercial grape-culture. Commercial fishing is still pursued to some extent, though much reduced since the herring run has diminished, a situation said to be due to the pollution of the Roanoke River. Oyster and other shell-fish culture is being developed. Wood-using industries are markedly predominant in the county. Although the huge North Carolina Pulp Company's plant is located in Martin County near the Martin-

Washington County line, it is regarded as a Plymouth enterprise enterprise, and most of the workers live in Plymouth. The company owns and manages 15,000 acres of reserve-timberland. There are, in Plymouth, one of the largest plywood plants in the United States, a box-container plant, and fork and hoe manufactures. There are also large sawmills at Roper and Creswell and numerous smaller plants in various parts of the county. The supplying of the factories with raw material has led to extensive logging-operations. Timber from adjoining counties and other points is brought to Plymouth by raft, barge, truck, and rail. Finished pulp is boated all the way to the Great Lakes via inland waterways.

Points of interest include the restored Somerset House (1804) in Pettigrew State Park which contains 16,800 acres on the north shore of Lake Phelps. This house was once the center of a 25,000-acre plantation. The house is one of the largest in the State and is one of the few plantation-mansions remaining in good condition. Nearby, there are slave quarters and a curious four-story barn on the edge of one of six drainage canals connecting Lake Phelps and Scuppernong River. The old Pettigrew Mansion (1830) is near the Somerset House.

Communities include Plymouth (county seat), Roper, Creswell, and Mackeys.

Rainfall (inches)	51.15
Snowfall (inches)	6.0
Mean annual temperature (degrees)	60.2
Growing season (days)	184
Tobacco (1952 Val.)	$976,313
Peanuts (1952 Val.)	$590,433
Corn (1952 Val.)	$504,310
Total Land Area (acres)	215,040
Forest Area (acres)	152,500
Population (1940)	12,323
Population (1950)	13,180
Total Tax Val.	$10,869,098
Tax Rate	$1.70

Watershed Boundaries - The boundaries of Coastal Plain River Basins extend, in a clockwise direction, generally as follows:

North River Basin (Camden and Currituck Counties)

Beginning at a point on Pasquotank River about two miles north of its confluence with Albemarle Sound;

Thence, in Camden County, along N. C. Highway 343 and a county road leading north therefrom, to a point on the county road about 1.5 miles south of the Village of Riddle;

Thence, along the divide between Cow Creek (North River Basin) and Portohonk Creek (Pasquotank River Basin) and the divide between Indiantown Creek (North River Basin) and Sawyers Creek (Pasquotank River Basin) and through Dismal Swamp to a point on the Camden-Currituck County line about five miles west of Snowden, Currituck County;

Thence in Currituck County, through Dismal Swamp and along the divide between Buffalo Creek (North River Basin) and Tull Creek (North Landing River Basin), to the Village of Maple;

Thence, along U. S. Highway 158, to Point Harbor at the confluence of Albemarle and Currituck Sounds; and

Thence, along the southern shores of Albemarle Sound, to the point of beginning.

Pasquotank River Basin and Little River Basin

Beginning on the northern shore of Albemarle Sound at Durants Neck in Perquimans County;

Thence, along a county road to New Hope;

Thence, along the divide between Suttons River passing west of Chapanoke and Parkville, to a point on the Perquimans-Pasquotank County line about 10 miles northeast of Hertford;

Thence, along the Perquimans-Pasquotank County line, and the Gates-Camden County line, to the Virginia-North Carolina State line;

Thence, along the Virginia-North Carolina State line, to the Camden-Currituck County line;

Thence, along the Camden-Currituck County line, to a point about five miles west of Snowden, Currituck County;

Thence, through Dismal Swamp and along the divide between Sawyers Creek (Pasquotank River Basin) and Indiantown Creek (North River Basin) and the divide between Portohonk Creek (Pasquotank River Basin) and Cow Creek (North River Basin) to a point on a county road about 1.5 miles south of the Village of Riddle, Camden County;

Thence, south along this road and along N. C. Highway 343 to a point on Pasquotank River about two miles north of its confluence with Albemarle Sound; and

Thence, along the northern shores of Albemarle Sound, to the point of beginning.

Perquimans River Basin and Yeopim River Basin

Beginning at the north end of N. C. Highway 32 bridge across Albemarle Sound;

Thence, northwest about five miles in Chowan County, to the intersection of N. C. Highways 32 and 37 near St. Johns;

Thence, northwest about 8.5 miles, to a point on the Norfolk Southern Railroad about two miles northeast of Edenton;

Thence, along the divide between Pollock Swamp (Chowan River Basin) and Burnt Mill Creek (Yeopim River Basin) and the divide between Rockyhock Creek (Chowan River Basin) and a tributary of Goodwin Creek (Perquimans River Basin) to the Village of Tyner, Chowan County;

Thence, along an unnumbered highway forming the Chowan-Perquimans County line, through Snow Hill to Joppa, Gates County;

Thence north, along the western edge of Dismal Swamp passing east of Wardville and Sumbury, to a point on N. C. Highway 32 about two miles southwest of Holly Grove;

Thence northwest, through Hall Pocosin, to a point on the boundary between Gates County and Virginia about four miles northeast of Hazelton, Gates County;

Thence east, along the Virginia-North Carolina State line, to the Gates-Camden County line;

Thence, along the Gates-Camden, Gates-Pasquotank, and Perquimans-Pasquotank County lines, to a point on the Perquimans-Pasquotank County line about 10 miles northeast of Hertford;

Thence, along the divide between Suttons Creek (Perquimans River Basin) and Little River passing west of Parksville and Chapanoke to New Hope, Perquimans County;

Thence southeast, along a county road, to the northern shore of Albemarle Sound at Durants Neck in Perquimans County; and

Thence, along the northern shores of Albemarle County, to the point of beginning.

Scuppernong River Basin

Beginning at the southern end, in Washington County, of N. C. Highway 32 bridge over Albemarle Sound;

Thence, along the southern shore of Albemarle Sound, to Dewey Pier in Tyrrell County;

Thence southeast and southwest in Tyrrell County, along the divide between Riders Creek (Scuppernong River Basin) and Alligator Creek (Alligator River Basin), the divide between Riders Creek and Second Creek (Alligator River Basin), and the divide between Second Creek (Scuppernong River Basin) and Northwest Fork Alligator River, to a point on the Tyrrell-Washington County line about 1.5 miles north of the point at which the Tyrrell-Washington, Hyde-Tyrrell, and Hyde-Washington County lines come together;

Thence, west and northwest in Washington County between Lake Phelps and Pungo Lake, to a point about two miles north of Pungo Lake;

Thence northeast, generally parallel to the western shore of Lake Phelps, to the Washington County road between Roper and Scuppernong Farms; and

Thence northwest and northeast, along the divide between Mackeys Creek (Mackeys Creek Basin) and Scuppernong River, and the divide between Mackeys Creek and Deep Creek (Scuppernong River Basin), to the point of beginning.

Alligator River Basin

Beginning at Dewey Pier, in Tyrrell County, on the southern shore of Albemarle Sound;

Thence east, along the southern shores of Albemarle Sound in Tyrrell and Dare Counties, to the Village of Mashoes at Caroom Point near the confluence of Albemarle and Croatan Sounds;

Thence southeast and southwest on the mainland of Dare County, along the divide between Alligator River and Croatan Sound, to a point on the Dare-Hyde County line about 5.5 miles east of the Atlantic Intracoastal Waterway Channel in Alligator River;

Thence, southwest in Hyde County along the divide between Alligator River and Pamlico Sound, to a point on the Boundary Canal north of Lake Mattamuskeet about 5.5 miles northwest of Englehard, Hyde County;

Thence west, along Boundary Canal to the summit of the Atlantic Intracoastal Waterway land-cut between Alligator and Pungo Rivers;

Thence northwest, passing west of Alligator River, to the point at which the Washington-Tyrrell, Washington-Hyde, and Tyrrell-Hyde County lines come together;

Thence northwest and northeast in Tyrrell County, along the divide between Northwest Fork Alligator River and Second Creek (Scuppernong River Basin), the divide between Second Creek (Alligator River Basin) and Riders Creek (Scuppernong River Basin), and the divide between Alligator Creek and Riders Creek, to the point of beginning.

North River Basin (Carteret County)

Beginning at Lennox Point, Carteret County, about 2.5 miles southeast of Beaufort;

Thence northwest and north, between N. C. Highway 101 and U. S. Highway 70, to a point about 1.5 miles east of the Atlantic Intracoastal Waterway;

Thence due east, about 6.5 miles, along the divide between North River and Back Creek (Neuse River Basin) and the divide between Ward Creek (North River Basin) and South River (Neuse River Basin);

Thence south, southeast, and south, passing west of Otway and east of Straits (Carteret County) and crossing The Straits, to a point on the southern

shore of Harkers Island about 1.5 miles west of the Village of Harkers Island; and

Thence west, across the mouth of North River in Back Sound, to the point of beginning.

Newport River Basin

Beginning at Fort Macon State Park;

Thence northwest and west, along the eastern shore of Bogue Banks and the northern shore of Bogue Sound, to the Morehead City Technical Institute;

Thence, along U. S. Highway 70, the divide between Newport River and Broad Creek (a tributary of Bogue Sound), and the divide between Newport River and Pettiford Creek (White Oak River Basin), to a point on the Carteret-Craven County line about 8.5 miles northwest of the Town of Newport;

Thence east, along the Craven-Carteret County line, to the source of Harloe Creek, a tributary of Newport River;

Thence, due east to a point about 1.5 miles east of the Atlantic Intracoastal Waterway;

Thence south, between N. C. Highway 101 and U. S. Highway 70, to the junction of these highways;

Thence, along U. S. Highway 70, to the Beaufort end of the Beaufort and Morehead City Railroad Bridge; and

Thence, along the western shores of two islands at the mouth of Newport River, to the southeastern point of the southern one of these two islands.

White Oak River Basin

Beginning at a point on the shore of the Atlantic Ocean about two miles southwest of Browns Inlet;

Thence in Onslow County, along the divide between French Creek and Cow Head Creek (New River Basin) and Bear Creek (White Oak River Basin), the divide bwtween Little Northeast Creek (New River Basin) and Grants Creek (White Oak River Basin), and the divide between Northeast Creek (New River Basin) and Starkys Creek (White Oak River Basin), and Northwest and North in Hoffman Forest, to a point on the Jones-Onslow County line about 8.5 miles east of Richlands, Onslow County;

Thence northeast in Jones County, through Hoffman Forest, to a point on the boundary of Hoffman Forest about seven miles southwest of Pollocksville, Jones County;

Thence southeast in Jones County, through Hoffman Forest and Croatan Forest to a point on the Jones-Craven County line about seven miles east of Maysville, Jones County;

Thence southeast and south in Craven County, crossing Croatan Cooperative Wildlife Management Area and passing between Great Lake and Long Lake and between Great Lake and Ellis Lake, to a point on the Craven-Carteret County line about 7.5 miles northwest of Newport, Carteret County;

Thence south and southwest in Carteret County, between the divide between Pettiford Creek (White Oak River Basin) and Newport River and the divide between Pettiford Creek and Broad Creek (a tributary of Bogue Sound),to the Carteret County end of N. C. Highway 24 bridge crossing White Oak River.

New River Basin

Beginning at a point on the Atlantic Ocean about one mile southwest of New River Inlet;

Thence northwest and north in Onslow County, along the divide between New River and Mill Creek (a tributary of the Atlantic Ocean), to a point on N.C. Highway 172 about five miles east of Folkstone, Onslow County;

Thence, along N. C. Highway 172, to Folkstone;

Thence northeast, along U. S. Highway 17, to Dixon;

Thence north, west, north, and northwest, along the divide between Padgett Swamp (Cape Fear River Basin) and Hickory Run (New River Basin), the divide between Padgett Swamp and Haws Run (New River Basin), the divide between Sandy Run (Cape Fear River Basin) and Harris Creek (New River Basin), the divide between Nine Mile Swamp (Cape Fear River Basin) and Southwest Creek (New River Basin), and the divide between Back Swamp (Cape Fear River Basin), and New River, to a point on the Duplin-Onslow County line about six miles west of Richlands, Onslow County;

Thence south, southeast, and south in Onslow County, through Hoffman Forest and along the divide between Northeast Creek (New River Basin) and Starkys Creek (White Oak River Basin), the divide between Little Northeast Creek (New River Basin) and Grants Creek (White Oak River Basin), the divide between Wallace Creek (New River Basin) and Queens Creek (a tributary of the Atlantic Ocean), the divide between Cows Head Creek (New River Basin) and Browns Creek (a tributary of the Atlantic Ocean), and the divide between Frenchs Creek (New River Basin) and Browns Creek (a tributary of the Atlantic Ocean), to a point on the shore of the Atlantic Ocean about two miles southwest of Browns Inlet; and

Thence, along the shore of the Atlantic Ocean, to the point of beginning.

Lockwoods Folly River Basin

Beginning at a point on Holden Beach about two miles west of Lockwoods Folly Inlet;

Thence, along the divide between Shallotte Creek (Shallotte River Basin) and Lockwoods Folly River and the divide between Shallotte River and Royal Oak Swamp (Lockwoods Folly River Basin) to a point in Green Swamp, on the divide between tributaries of the Waccamaw River and Shallotte and Lockwoods Folly Rivers, about 5.5 miles northeast of the Town of Shallotte;

Thence, east along the third divide indicated above, to a point in Green Swamp about 7.5 miles north of Bolivia;

Thence south to Bolivia;

Thence, along the divide between Middle Swamp Creek (Lockwoods Folly River Basin) and Mills Creek (Cape Fear River Basin) the divide between River Swamp (Lockwoods Folly River Basin) and Orton Pond (Cape Fear River Basin), and the divide between Mercers Mill Pond (Lockwoods Folly River Basin) and Beaverdam Creek (a tributary of Elizabeth River), to a point on the Atlantic Ocean about five miles east of Lockwoods Folly Inlet; and

Thence west, along the shore of the Atlantic Ocean, to the point of beginning.

Shallotte River Basin

Beginning at a point on Hales Beach (otherwise known as Ocean Isle and Gause Beach) about 4.5 miles west of Shallotte Inlet;

Thence northwest, through Gause Landing and along the divide between Calabash River (a tributary of Little River in South Carolina) and Saucepan Creek (Shallotte River Basin) and the divide between Calabash River and Shallotte River, to a point on the divide between Cawcaw Swamp (Waccamaw River Basin) and Shallotte River about nine miles northwest of Shallotte;

Thence east, along the divide between Wet Ash Swamp (Waccamaw River Basin) and McMilly Swamp (Shallotte River Basin), to a point about 5.5 miles northeast of the Town of Shallotte;

Thence generally south, along the divide between Shallotte River and Royal Oak Swamp (Lockwoods Folly River Basin) and the divide between Shallotte Creek (Shallotte River Basin) and Lockwoods Folly River, to a point on Holden

Beach about two miles west of Lockwoods Folly Inlet; and
Thence to the point of beginning.

Streams in the Coastal Plain River Basins - There follow lists, alphabetically arranged, of streams in the Coastal Plain River Basins, the names of which are shown on available maps. There are numerous streams on such maps, the names of which are not indicated. There are shown, on the following lists, the streams into which each of the streams, alphabetically arranged, flow, and also the county in which the junction is located. It is believed that the lists will be helpful to interested persons in quickly locating, on a county, topographical, or other map, any stream included in the lists and also tracing the course of the stream throughout the basin in which it is located.

North River Basin (Camden and Currituck Counties)

Stream	Receiving Stream	County in Which Junction Occurs
Bullfrog Creek	North River	Currituck
Cow Creek	North River	Camden
East Creek	North River	Currituck
Indiantown Creek	North River	Camden-Currituck
North River	Albemarle Sound	Camden-Currituck
Run Swamp	Indiantown Creek	Currituck

Pasquotank River Basin and Little River Basin

Arenuse Creek	Pasquotank River	Camden
Knobbs Creek	Pasquotank River	Pasquotank
Little River	Albemarle Sound	Perquimans-Pasquotank
New Begun Creek	Pasquotank River	Pasquotank
Pasquotank River	Albemarle Sound	Camden-Pasquotank
Portohonk Creek	Pasquotank River	Camden
Raymond Creek	Pasquotank River	Camden
Sawyers Creek	Pasquotank River	Camden
Symonds Creek	Little River	Pasquotank

Perquimans River Basin and Yeopim River Basin

Burnt Mill Creek	Yeopim River	Chowan-Perquimans
Goodings Mill Creek	Perquimans River	Perquimans
Goodwin Creek	Perquimans River	Perquimans
Middleton Creek	Yeopim River	Perquimans
Mill Creek	Perquimans River	Perquimans
Perquimans River	Albemarle Sound	Perquimans
Raccoon Creek	Perquimans River	Perquimans
Skinners Creek	Perquimans River	Perquimans
Suttons Creek	Perquimans River	Perquimans
Yeopim Creek	Yeopim River	Perquimans
Yeopim River	Albemarle Sound	Chowan-Perquimans

Scuppernong River Basin

Batava Canal	Scuppernong River	Tyrrell
Bee Tree Canal	Scuppernong River	Tyrrell
Lake Phelps	Six Drainage Canals	Tyrrell & Washington
Mauls Creek	Scuppernong River	Washington
Moccasin Canal	Scuppernong River	Washington
Riders Creek	Scuppernong River	Tyrrell

Scuppernong River Basin, continued

Stream	Receiving Stream	County in Which Junction Occurs
Second Creek	Scuppernong River	Tyrrell
Scuppernong River	Albemarle Sound	Tyrrell
Thirty-foot Canal	Scuppernong River	Washington
Transportation Canal	Scuppernong River	Tyrrell-Washington

Alligator River Basin

Alligator Creek	Alligator River	Tyrrell
Alligator Lake	New Lake Fk. Alligator River	Hyde
Alligator River	Albemarle Sound	Dare-Tyrrell
Boundary Canal	Alligator River	Hyde
East Lake	Alligator River	Dare
Goose Creek	Alligator River	Tyrrell
Juniper Creek	Northwest Fk.Alligator River	Tyrrell
Milltail Creek	Alligator River	Dare
New Lake Fork	Alligator River	Hyde
Northwest Fork	Alligator River	Tyrrell
Second Creek	Alligator River	Tyrrell
South Lake	Alligator River	Dare
Southwest Fork	Northwest Fk. Alligator River	Tyrrell
The Frying Pan	Alligator River	Tyrrell

North River Basin (Carteret County)

North River	Back Sound	Carteret
Taylor Creek	North River	Carteret
Ward Creek	North River	Carteret

Newport River Basin

Bell Creek	Core Creek	Carteret
Billys Branch	Black Creek	Carteret
Black Creek	Newport River	Carteret
Calico Creek	Newport River	Carteret
Cedar Swamp Creek	Newport River	Carteret
Core Creek	Newport River	Carteret
Deep Creek	Newport River	Carteret
Eastman Creek	Core Creek	Carteret
Ghouls Fork	Black Creek	Carteret
Harlow Creek	Newport River	Carteret
Little Creek Swamp	Newport River	Carteret
Money Island Swamp	Black Creek	Carteret
Newport River	Bogue Sound	Carteret
Northwest Prong	Newport River	Carteret
Oyster Creek	Newport River	Carteret
Russell Creek	Newport River	Carteret
Shoe Branch	Newport River	Carteret
Southwest Prong	Newport River	Carteret
Town Creek	Newport River	Carteret
Ware Creek	Newport River	Carteret

White Oak River Basin

Black Swamp Creek	White Oak River	Jones
Caleb Branch	Hadnot Creek	Carteret

White Oak River Basin, continued

Stream	Receiving Stream	County in Which Junction Occurs
Calebs Creek	White Oak River	Onslow
Cales Creek	White Oak River	Carteret
Cartwell Branch	Hollands Mill Creek	Onslow
Cummins Creek	Grants Creek	Onslow
Freemans Creek	White Oak River	Onslow
Grants Creek	White Oak River	Jones
Grape Branch	White Oak River	Jones
Great Lake	Hunter Creek	Craven
Hadnot Creek	White Oak River	Carteret
Holland Branch	Hollands Mill Creek	Onslow
Holston Creek	White Oak River	Jones
Hunters Creek	White Oak River	Jones-Carteret
Mulberry Creek	White Oak River	Onslow
Pettiford Creek	White Oak River	Carteret
School House Branch	Hadnot Creek	Carteret
Starkey Creek	Pettiford Creek	Carteret
Starky Creek	White Oak River	Onslow
Webb Creek	White Oak River	Onslow
White Oak River	Bogue Sound	Carteret-Onslow

New River Basin

Bachelor's Delight Swamp	New River	Onslow
Blue Creek	New River	Onslow
Branson Creek	New River	Onslow
Chaney Creek	New River	Onslow
Coglin Creek	New River	Onslow
Cow Head Creek	French Creek	Onslow
Cow Horn Swamp	New River	Onslow
Deep Gully Creek	New River	Onslow
Deep Run	Southwest Creek	Onslow
Duck Creek	New River	Onslow
Everett Creek	New River	Onslow
French Creek	New River	Onslow
Fullards Creek	New River	Onslow
Half Moon Creek	New River	Onslow
Harris Creek	Southwest Creek	Onslow
Hickory Run	Southwest Creek	Onslow
Jenkins Swamp	Cow Horn Swamp	Onslow
Juniper Swamp	Cow Horn Swamp	Onslow
Lewis Creek	New River	Onslow
Little Northeast Creek	Northeast Creek	Onslow
Mill Creek	New River	Onslow
Mill Run	Southwest Creek	Onslow
Mill Swamp	New River	Onslow
Millstone Creek	New River	Onslow
Muddy Creek	New River	Onslow
New River	Atlantic Ocean	Onslow
Northeast Creek	New River	Onslow
Poplar Creek	Little Northeast Creek	Onslow
Rocky Run	Little Northeast Creek	Onslow
Scale Creek	New River	Onslow
Southwest Creek	New River	Onslow
Stone Creek	New River	Onslow

New River Basin, continued

Stream	Receiving Stream	County in Which Junction Occurs
Town Creek	New River	Onslow
Traps Creek	New River	Onslow
Wallace Creek	New River	Onslow
Whitehurst Creek	New River	Onslow
Wolf Swamp	New River	Onslow

Lockwoods Folly River Basin

Big Bay Branch	Middle Swamp Creek	Brunswick
Lockwoods Folly River	Atlantic Ocean	Brunswick
Mercers Mill Pond	Lockwoods Folly River	Brunswick
Middle Swamp Creek	Lockwoods Folly River	Brunswick
Pinch Gut Creek	Piney Grove Swamp	Brunswick
Piney Grove Swamp	Lockwoods Folly River	Brunswick
River Swamp	Lockwoods Folly River	Brunswick
Royal Oak Swamp	Lockwoods Folly River	Brunswick

Shallotte River Basin

Bobby's Pike Creek	Shallotte River	Brunswick
Little Shallotte River	Shallotte River	Brunswick
McMilly Swamp	Shallotte River	Brunswick
Saucepan Creek	Shallotte River	Brunswick
Shallotte River	Atlantic Ocean	Brunswick

"Progress Report No. 1, Public Surface-water Supplies in North Carolina, Descriptions and Chemical Character, 1947", prepared by the Geological Survey, U. S. Department of the Interior, in cooperation with the North Carolina State Board of Health, sets forth no use of surface water by municipalities in the North (Carteret County), North (Camden and Currituck Counties), Pasquotank, Perquimans, Alligator, Scuppernong, Newport, White Oak, New (Onslow County), Lockwood Folly, and Shallotte River Basins.

Progress Report No. 2, Public Ground-Water Supplies in North Carolina, Descriptions and Chemical Character, 1949", prepared by the Geological Survey, U. S. Department of the Interior, in cooperation with the North Carolina State Board of Health, contains the following information pertaining to municipalities indicated below.

Beaufort, Carteret County

Population - 1940: 3,272 (1950: 3,212)
Ownership - Tide Water Power Company

Sources	Well 1	Well 2
Depth of well (ft.)	300	400
Diam. of well (in.)	10	8
Yield (g.p.m.)	-	-

Sample collected (mixed, treated water) April 3, 1947

Treatment	Chlorination
Color	14
pH	7.4
Silica	44
Iron	0.05
Calcium	78
Magnesium	19
Na + K	25
Bicarbonate	378
Sulfate	1.6
Chloride	9.5
Fluoride	0.6
Nitrate	0.1
Dissolved solids	371
Total hardness	273

Elizabeth City, Pasquotank County

Population - 1940: 11,564 (1950: 12,685)

Sources	220 wells	14 wells	3 wells
Depth of wells (ft.)	30	30	75
Diam. of wells (in.)	2	6	6
Yields (g.p.m.)	-	-	-

Sample collected (mixed, treated water) - Feb. 16, 1946
Treatment - Iron removal, lime, chlorination, filtration, final adjustment of pH by recarbonation.

Color	9
pH	9.6
Silica	37
Iron	0.60
Calcium	17
Magnesium	19

Elizabeth City (continued)

	220 wells	14 wells	3 wells
Na + K		81	
Bicarbonate		84*	
Sulfate		67	
Chloride		111	
Fluoride		0.4	
Nitrate		0.5	
Dissolved solids		389	
Total hardness		120	

*Includes equivalent of 32 parts of carbonate (CO_3).

Hertford, Perquimans County

Population - 1940: 1,959 (1950: 2,096)

Sources	40 wells		
Depth of wells (ft.)	25-49		
Diameter of wells (in.)	1.25-2		
Yield (g.p.m.)	120		

Sample collected (mixed, treated water)-June 26, 1946

Treatment - Aeration, lime, filtration, and chlorination

Color	7	Bicarbonate	61*
pH	8.6	Sulfate	5.3
Silica	33	Chloride	110
Iron	0.07	Fluoride	0.2
Calcium	25	Nitrate	1.8
Magnesium	5.3	Dissolved solids	326
Na + K	58#	Total hardness	84

* Includes equivalent of 13 parts of carbonate (CO_3).
# Includes equivalent of 3.3 parts of potassium (K).

Jacksonville, Onslow County

Population - 1940:873 (1950-3,960)

Sources	Well 1	Well 2
Depth of wells (ft.)	185	175
Diam. of wells (in.)	8	8
Yield (g.p.m.)	300	300

Treatment - Chlorination and aeration.

Samples collected - August 18, 1949

	Well 1 (raw water)	Well 2 (raw water)	Mixed, treated water
Color	7	7	6
pH	7.2	7.2	7.3
Silica	35	35	35
Iron	0.08	0.14	0.10
Calcium	53	52	52
Magnesium	16	14	16
Na + K	104	119	108
Bicarbonate	460	451	449
Sulfate	3.3	3.6	3.2
Chloride	30	49	40
Fluoride	0.9	0.8	0.7
Nitrate	0.2	0.7	0.3
Dissolved solids	475	501	482
Total hardness	198	187	196

Manteo, Dare County

Population - 1940:571 (1950:635)

Sources	Well 1	Well 2	Well 3
Depth of wells (ft.)	34	27	27
Diam. of wells (in.)	6	1.5	1.5
Yield (g.p.m.)	60	20	20

Treatment - Aeration over coke, and chlorination.

Samples collected - Dec. 16, 1947.

	Well 1 (raw water)	Well 2 (raw water)	Well 3 (raw water)	Mixed, treated water
Color	3	4	5	4
pH	7.0	5.9	6.0	7.9
Silica	6.4	5.1	4.2	6.9
Iron	2.3	5.3	8.4	0.61
Calcium	49	10	14	50
Magnesium	3.4	3.5	2.6	3.5
Na + K	25	20	22	25
Bicarbonate	148	33	48	151
Sulfate	17	16	13	16
Chloride	37	27	29	38
Nitrate	0.5	0.0	0.0	0.1
Dissolved solids	221	100	117	222
Total hardness	136	39	46	139

Richlands, Onslow County

Population - 1940:688 (1950:877)

Source	Well		
Depth of well (ft.)	556		
Diam. of well (in.)	6		
Yield (g.p.m.)	75		
Sample collected	Jan 2, 1948		
Treatment	none		
Color	7	Bicarbonate	274*
pH	8.1	Sulfate	1.4
Iron	0.08	Chloride	4.5
Silica	10	Fluoride	0.3
Calcium	4.6	Nitrate	0.1
Magnesium	2.9	Dissolved solids	262
Na + K	97	Total hardness	23

*Includes equivalent of 10 parts of carbonate (CO_3).

Swansboro (Onslow County)

Population - 1940:454 (1950-559)

Source	Well		
Depth of well (ft.)	80		
Diam of well (in.)	8		
Yield (g.p.m.)	100		
Sample collected -	Aug. 31, 1949		
Treatment	None		
Color	3	Bicarbonate	231
pH	7.0	Sulfate	0.9
Silica	28	Chloride	16
Iron	2.3	Fluoride	0.1
Calcium	71	Nitrate	0.2
Magnesium	2.9	Dissolved solids	248
Na + K	11	Total hardness	189

"Bulletin No. 47, Progress Report on Ground Water in North Carolina by M. J. Mundorff, 1945", prepared in cooperation with the Geological Survey, U.S. Department of the Interior and published by the North Carolina Department of Conservation and Development, contains information regarding wells in the Coastal Plain River Basins, used for the purpose of supplying water to municipalities, U. S. Army, U. S. Marine Corps, U. S. Navy, and Tide Water Power Company, as follows:

Brunswick County

Location - Southport

Owner - Town	Well 1	Well 2
Depth of well (ft.)	150	110
Diameter (in.)	8	12
Chief aquifer	Shellrock	Shellrock
Yield (g.p.m.)	150	50
Hardness	194	-
Chloride	50	-

Location - Fort Caswell

Owner - Army	
Depth (ft.)	125
Diameter (in.)	6
Chief aquifer	Shellrock
Yield (g.p.m.)	av. 50 ±
Remarks	Four wells.

Carteret County

Location - Atlantic Beach

Owner - Atlantic Beach Co.	
Depth (ft.)	190
Diameter (in.)	1.25
Chief aquifer	Shellrock
Yield (g.p.m.)	25
Hardness	276
Chloride	17
Remarks	Two wells

Location - Beaufort

Owner - Tide Water Power Co.		
	Well 1	Well 2
Depth (ft.)	440	300
Diam. (in.)	10-8	10
Chief aquifer	Shellrock	Shellrock
Yield (g.p.m.)	500	?
Remarks	Horizons at 300 and 440 feet.	

Location - Morehead City

Owner - Tide Water Power Co.	
Depth (ft.) - av. 250	
Diameter (in.)	6
Chief aquifer - Shellrock (Trent)	
Hardness	229
Chloride	21
Remarks	Four wells.

Chowan County

Location - Edenton
Owner - Town

	Well 1	Well 2	Well 3
Depth (ft.)	290	358	212
Diameter (in.)	12	10-8	8
Chief aquifer	Sand & shell	Sand & shell	Sand & shell
Yield (g.p.m.)	650	500	200
Hardness	195	204	210
Chloride	110	116	120
Remarks	Gravel-walled	Gravel-walled	-

Location - Edenton
Owner - Naval Air Base

Depth (feet)	40
Diameter (in.)	6
Chief aquifer	Sand (Pleistocene)
Yield (g.p.m.)	40
Hardness	47
Chloride	16
Remarks	Nine wells used. Average 40 feet deep.

Location - Edenton
Owner - Naval Air Base

	Well 10	Well 11
Depth (ft.)	420	269
Diameter (in.)	8	8
Chief aquifer	Sand & Shellrock	Same
Yield (g.p.m.)	-	250
Hardness	-	330
Chloride	-	710
Remarks	Salt water	Salty water at 248 feet.

Craven County

Location - Cherry Point
Owner - Marine Air Base

Depth (ft.)	250 av.
Diameter (in.)	8
Chief aquifer - Sand and shellrock (Duplin and Trent)	
Yield (g.p.m.)	310 av.
Hardness	190 ±
Chloride	10 ±
Remarks 12 wells in main system. Average drawdown - 8 feet.	

Location - New Bern
Owner - City
Depth (ft.) - 80 to 110
Diameter (in.) - 18-8
Chief aquifer - Miocene limestone (Trent)
Yield (g.p.m.) - 250 av.
Hardness - 200 ±
Chloride - 10 ±
Remarks - 8 gravel-walled wells. Drawdown very small.

Dare County

Location -Manteo
Owner - Town
Depth (ft.) - 45
Diameter (in.) - 6
Chief aquifer - Sand (Pleistocene?)
Yield (g.p.m.) - 60 each
Hardness - 114
Remarks - 2 gravel-packed wells.

Location - Manteo
Owner - Naval Air Base
Depth (ft.)- 60
Diameter (in.) - 6
Chief aquifer - Sand (Pleistocene?)
Yield (g.p.m.) - 75 each
Hardness - 111 & 123
Chloride - 24 & 23
Remarks - 2 wells.

Hyde County

Location - Englehard
Owner - Pamlico Ice & Light Co.
Depth (ft.) - 150 to 215
Diameter (in.) - 2 & 3
Chief aquifer - Sand (Miocene?)
Yield (g.p.m.) - 100
Remarks - 2 wells.

Location - Swanquarter
Owner - County Agriculture Building
Depth (ft.) - 180
Diameter (in.) - 2
Chief aquifer - Sand (Miocene?)
Yield (g.p.m.) - 20
Chloride - 15

Jones County

Location - Pollocksville
Owner - Naval Air Base

	Well 1	Well 2
Depth (ft.)	67	54
Diameter (in.)	8	8
Chief aquifer	Limestone (Castle Hayne)	Same
Yield (g.p.m.)	180	200
Remarks	8.5 feet drawdown	-

Location - Trenton
Owner - County
Depth (ft.) - 212
Diameter (in.) - 3
Chief aquifer - Limestone (Pee Dee)
Yield (g.p.m.) - 35
Hardness - 138
Chloride - 7

Onslow County

Location - Camp Davis
Owner - U. S. Army
Depth (ft.) - 175 av.
Diameter (in.) - 8
Chief aquifer - Shellrock (Castle Hayne)
Yield - 220 av.
Remarks - Average drawdown 3.3 feet (Number of wells not indicated).

Location - Holly Ridge
Owner - Town
Depth (ft.) - 180
Diameter (in.) - 8
Chief aquifer - Shellrock (Castle Hayne)
Yield (g.p.m.) - 330
Remarks - 9 feet drawdown.

Location - Jacksonville
Owner - Town

	Well 1	Well 2
Depth (ft.)	200	185
Diameter (in.)	4	8
Chief aquifer	Shellrock (Castle Hayne)	Same
Yield (g.p.m.)	-	300
Hardness	204	-
Chloride	27	-
Remarks	Flows into reservoir	8 feet drawdown

Location -	Camp Lejeune	Camp Lejeune
Owner -	Marine Base	Tent Camp
Depth (ft.)	167 av.	100 av.
Diameter (in.)	8	8
Chief aquifer	Sand & Shellrock (Trent & Castle Hayne)	Sand & Shellrock (Trent)
Yield (g.p.m.)	220 av.	175 av.
Hardness	200	200
Chloride	15	15
Remarks	21 gravel-packed wells	11 gravel-packed wells, 2 screened.

Location - Richlands
Owner - Town
Depth (ft.) - 550
Diameter (in.) - 6
Chief aquifer - Sand (Pee Dee)
Yield (g.p.m.) - 100
Hardness - 36
Chloride - 3
Remarks - Soft water.

Pasquotank County

Location	Elizabeth City	Elizabeth City	Elizabeth City
Owner	City	Consolidated Aircraft	Patrol Plane Base
Depth (ft.)	30 av.	105	85 av.
Chief aquifer	Sand	Sand	Sand
Diameter (in.)	1.25	8	8
Yield	5 av.	240 av.	175 av.
Hardness	150	198 to 240	49

Pasquotank County, Elizabeth City (continued)

Chloride	15	44 to 67	15
Remarks	About 230 wells	2 wells	2 wells

Perquimans County

Location - Harvey Point
Owner - Naval Air Base
Depth (ft.) - 84 av.
Diameter (in.) - 8
Chief aquifer - Sand, Pliocene (Croatan)
Yield (g.p.m.) - 135 av.
Hardness - 63
Chloride - 18
Remarks - 2 wells in use.

Location - Hertford
Owner - Town
Depth (ft.) - 25 to 50
Diameter (in.) - 1.25 & 2
Chief aquifer - Sand (Yorktown)
Yield (g.p.m.) - 5 to 10 each
Hardness - 270
Chloride - 44
Remarks - 30 wells in use.

Washington County

Location - Plymouth
Owner - Town
Depth (ft.) - 158
Diameter (in.) - 10
Chief aquifer - Shellrock (Yorktown)
Yield (g.p.m.) - 500
Hardness - 232
Chloride - 258

General - Information regarding agriculture in the Coastal Plain River Basins may be found hereinbefore in Chapter I of this publication under "General Information regarding Counties".

Data regarding Agricultural Production - Information regarding farm population, total land in farms, harvested cropland, idle cropland, use of fertilizer, and agricultural products for the counties lying wholly or partially within the Coastal Plain River Basins, according to the 1952 Farm Census of 1951 crops, is shown on pages 34 and 35. The figures are in acres, unless otherwise indicated.

Permits to use Water for Irrigation - The following permits, to use surface water in the Coastal Plain River Basins, have been issued by the Director of the Department of Conservation and Development in accordance with the provisions of Section 113-8.1, General Statutes of North Carolina, as amended.

Permit No.	Name	Address	Source	Amount (c.f.s.)
	Chowan County			
547	Wilber & Vance Hare	Tyner	Dillard Creek	1.82
541	T. S. Leary	R#1, Edenton	Rockyhock Creek	1.79
548	Ray Byrum	R#1, Edenton	Rockyhock Creek	1.33
549	Lonnie Harrell	R#1, Edenton	Rockyhock Creek	1.82
561	C. O. Forehand	R#3, Edenton	Rockyhock Creek	1.12
486	R. C. Holland	Edenton	Chowan River	1.42
688	S. F. Small	R#2, Edenton	Pembroke Creek	1.30
104	E. L. Ward	Edenton	Beaver Hill Cr.	1.02
687	S. F. Small	R#2, Edenton	Blount Creek	1.30
91	W. E. Bond	R#3, Edenton	Pembroke Creek	1.74
877	Claude E. Small	R#3, Edenton	Pembroke Creek	1.49
887	Bristoe Perry	R#3, Edenton	Chowan River	3.40
	Craven County			
514	R. L. Baysden	Ernul	Br. of Beaverdam Swp.	0.40
376	W. M. Dial	R#2, New Bern	Br. of Batchelders Cr.	0.41
410	G. S. Cook	Clarks	Batchelders Creek	0.72
	Jones County			
543	Bruce Foy	R#2, Trenton	Trent River	1.02
226	I. F. Eubanks	R#2, Trenton	Trent River	0.75
526	J. F. Burton	Box 482, Kinston	Trent River	0.73
223	P.L., J.L.& E.H.Foy	R#2, Trenton	Trent River	0.85
304	R. T. Johnson	R#2, Trenton	Trent River	0.76
662	G. W. Jarvis	608 Spence Dr., Kinston	Mill Run Br.	0.27
	Onslow County			
240	F. E. Moody	R#1, Maysville	Hadnots Branch	0.45
	Perquimans County			
20	White Produce Farm	Box 301, Hertford	Raccoon Creek	1.14

ITEM	BRUNSWICK COUNTY	CAMDEN COUNTY	CARTERET COUNTY	CHOWAN COUNTY	CRAVEN COUNTY	CURRITUCK COUNTY	DARE COUNTY	HYDE COUNTY
Harvested Cropland	32,452	35,259	12,037	33,699	53,784	35,639		33,766
Idle Cropland	7,599	931	3,066	1,665	6,366	1,145		1,314
Pasture	3,848	1,415	1,874	2,662	5,977	2,106		2.995
Woods, Home-Sites, etc.	143,080	23,594	39,587	48,689	123,193	48,239		30,934
Corn Harvested	13,205	16,038	3,784	13,434	26,831	15,221		11,766
Cotton Harvested	444	603	233	3,090	1,095	642		825
Tobacco Harvested	4,998	10	2,025	870	12,840	5		3
Peanuts	2,552	94	664	7,955	272	264		8
Wheat	174	22	88	48	169	43		192
Oats	1,904	304	214	14	762	139	No other data available	1,414
Other small grains	267	7	53	28	195	85		78
Soybeans	2,506	15,680	1,320	5,492	4,905	15,941		18,736
Lespedeza	94	82	24	-	87	31		1,418
Hay Crops Harvested	3,156	391	576	391	4,335	455		803
Other Hays cut	823	2	119	23	144	78		-
Irish potatoes	82	1,832	1,010	58	123	1,870		286
Sweet potatoes	1,240	16	620	228	574	418		2
Other vegetables grown	914	252	1,645	2,515	350	1,901		195
Other crops harvested	1,406	105	363	363	1,117	170		315
Total land in farms	186,979	61,559	56,565	86,715	189,320	87,129		69,009
Total land area	558,720	152,960	340,480	115,200	464,000	174,720	248,320	405,760
Comm.fert.used, tons	8,398	7,970	5,131	7,778	15,219	9,526		4,370
Sows and gilts, No.	1,769	711	686	1,976	1,658	834		801
Cows and heifers, No.	1,400	759	635	744	2,135	1,698		1,428
Hens and pullets, No.	40,617	20,578	17,705	33,334	49,613	34,815		32,050
Tractors in usable condition,No.	613	373	268	513	986	359		266
Farm population, No.	12,128	2,944	4,021	5,426	12,265	3,858		3,303
Total population, 1950, No.	19,238	5,223	23,059	12,540	48,823	6,201	5,405	6,479

ITEM	JONES COUNTY	ONSLOW COUNTY	PASQUOTANK COUNTY	PERQUIMANS COUNTY	TYRRELL COUNTY	WASHINGTON COUNTY	TOTAL
Harvested Cropland	42,538	49,808	45,072	46,459	15,759	29,799	466,071
Idle Cropland	3,598	6,630	805	1,003	939	3,360	38,421
Pasture	4,800	6,408	4,082	2,012	3,166	5,593	46,938
Woods, Home-sites, etc.	95,554	123,535	33,454	52,863	26,280	38,441	827,443
Corn Harvested	24,558	27,618	20,732	19,709	6,242	9,400	208,538
Cotton Harvested	702	819	593	1,970	442	815	12,733
Tobacco Harvested	7,999	9,409	-	-	-	1,378	39,537
Peanuts	531	1,950	103	4,438	359	4,386	23,576
Wheat	126	81	36	38	103	127	1,247
Oats	1,004	279	409	206	165	289	7,103
Other small grains	218	92	22	276	39	155	1,515
Soybeans	3,584	3,756	18,092	18,680	9,584	11,703	129,979
Lespedeza	479	118	450	257	63	179	3,282
Hay Crops Harvested	3,231	2,065	1,086	463	390	968	18,310
Other Hays Cut	231	473	33	8	28	31	1,993
Irish potatoes	190	86	2,844	50	892	32	9,355
Sweet potatoes	240	287	73	112	131	72	4,013
Other vegetables grown	242	135	3,449	239	54	210	12,101
Other crops harvested	599	1,089	131	255	82	382	6,377
Total land in farms	146,490	186,381	83,413	102,347	45,699	74,746	1,376,352
Total land area	298,880	483,840	146,560	167,040	255,360	215,040	4,026,880
Comm. fert. used, tons	10,861	12,514	13,296	7,572	3,542	5,208	111,385
Sows and gilts, No.	2,008	2,955	1,182	1,653	1,341	1,187	18,761
Cows and heifers, No.	1,670	2,077	2,146	1,116	999	894	17,701
Hens and Pullets, No.	37,641	53,595	27,057	36,797	23,538	21,910	429,250
Tractors in usable condition, No.	526	778	566	636	218	368	6,470
Farm population, No.	7,016	11,402	4,374	4,558	2,643	4,798	78,736
Total population, 1950, No.	11,004	42,047	24,347	9,602	15,194	13,180	242,342

CHAPTER IV - USE OF WATER FOR RECREATION

Recreational Facilities and Fishing

"North Carolina Almanac, 1954-55", published by The Almanac Company, Raleigh, North Carolina, contains the following information regarding recreational facilities and use of water for recreation in the 14 counties lying wholly or partially within the Coastal Plain River Basins included in this publication:

Brunswick County

Recreational Facilities - Fishing is the main recreational-attraction. The Atlantic Ocean, Cape Fear River, and other waterways provide opportunity for every type of maritime sport. Beaches run almost due east and west, and are well-sheltered. A deep yacht-basin is located at Southport.

Fishing - Amberjack, barracuda, sailfish, dolphin, and other large species, as well as trout, bluefish, and mackerel, are found at Frying Pan Shoals. Surf-fishing for channel bass is good at Baldhead. Puppydrum and striped-bass fishing are good throughout the winter. Bass and other game-species are found in Town Creek and other streams. Fishing is recommended in some parts of Waccamaw and Brunswick Rivers and McKinzie Pond.

Camden County

Recreational Facilities - North and Pasquotank Rivers provide fishing and boating.

Fishing - Speckled perch and pike are found in Pasquotank River and tributaries. In the North River, fishing is good for striped bass, large-mouth bass, and perch. Several fishable-creeks include South, Broad, and Little Creeks.

Carteret County

Recreational Facilities - Water sports are available on Bogue and Core Sounds. Atlantic Beach, an east-west beach, is a thriving summer-resort. At Morehead City, there are a great number of sport-fishing boats for charter and at other points on U. S. Highway 70 northeast of Beaufort, ferry boats cross Core Sound to Ocracoke Island and Cape Lookout.

Fishing - Excellent inshore and offshore fishing is available in numerous salt-waters including the Atlantic Ocean. In season, boats go offshore to Cape Lookout or the Gulf Stream for amberjack, dolphin, sailfish, cero, and other large species. Good channel-bass fishing is available in the surf at Drum Inlet. Inshore fishing occurs in these and most other places on the coast.

Chowan County

Recreational Facilities - At Edenton, golf, large indoor-swimming pool, tennis, boating, and night-baseball and football in a modern stadium are available. Numerous waters are suitable for small boats.

Fishing - Large species are found in Edenton Bay, Albemarle Sound, Chowan River, and Yeopim River. Bass, perch, bream, and jack are caught in Pembroke and Bethel Creeks. Dillard Pond and Burnett Mill Pond contain bass, perch, and bream.

Craven County

Recreational Facilities - New Bern's facilities include riding, swimming, boating, golf, tennis, softball, large community building, two service clubs, Country Club, and Trent Pines Club. The Eastern Carolina Yacht Club Regatta and outboard-motor races, and beagle trials, are held at New Bern in the summer and late fall, respectively. New Bern has boating facilities including repair yards, servicing, and storage. Picnicking and camping areas are available in Croatan National Forest.

Fishing - Bass and jacks are found in Trent River, and crappie, sunfish, white perch, and bass are caught in tributaries of Neuse River below New Bern. Catfish Lake, Great Lake, and other lakes contain good bass, perch, and crappie.

Currituck County

Recreational Facilities - There are no organized facilities except hunting and fishing. The beach on the Outer Bank east of Currituck Sound affords swimming.

Fishing - Black bass, striped bass, perch, bream, pickerel, crappie, and robin are found in Currituck Sound, North River, Northwest River, and Tull Bay. Waterfowl-hunting is excellent.

Dare County

Recreational Facilities - Marine sports and surf bathing along the beaches, especially at Nags Head, and swimming in Croatan Sound near Manteo are available. One of the largest youth camps in North Carolina, used 90 percent of the summer by 4-H Club boys, is located on Roanoke Island. The National Park Service has developed the National Seashore Park in Dare County. Boating and deep-sea and other fishing are available at numerous points. Performances of "The Lost Colony" drama occurs on Roanoke Island from July 1 to Labor Day.

Fishing - Water-fowl hunting is excellent all along the coast. Channel-bass fishing is available at Oregon and Hatteras Inlets. Gulf-stream fishing occurs near Cape Hatteras. Bass, perch, etc., are caught in fresh-water ponds, Alligator River, East Lake, and South Lake.

Hyde County

Recreational Facilities - Excellent fishing and water-fowl hunting are major recreational-attractions. Lake Mattamuskeet Wildlife Refuge abounds with geese, ducks, swans, and numerous other birds. Two areas of the lake, each containing about 5,000 acres, have been set aside as public-shooting grounds. The Village of Ocracoke, on Ocracoke Island, has a sportsmen's club, charter boats for fishing, and hunting guides.

Fishing - Mattamuskeet Lake, Alligator River, Long Shoal River, and Rose Bay Creek contain bass, crappie, white perch, and carp. There are, at Ocracoke, good surf-casting, bottom fishing, and inshore fishing. Gulf-stream fishermen go to the nearby Village of Hatteras to take offshore boats.

Jones County

Recreational Facilities - Fishing and hunting are the chief recreational facilities. Others include Hoffman Forest, a 62,000-acre conservation-and-recreation area administered by North Carolina State College; Indian Camp Recreational Park, with cabins on the shores of 80-acre Lake McKinney; Croatan National Forest, created in 1934; and Trent River which offers beautiful boat trips.

Onslow County

Recreational Facilities - Recreation of interest to tourists is largely confined to fishing and hunting, although there are miles of undeveloped beaches along the eastern boundary of the county. Boats and guides are available. There is a small resort at Swansboro (mostly fishing) and a hunting lodge at Holly Ridge.

Fishing - Salt-water fishing, particularly for inshore species such as trout, sea bass, bluefish, and mackerel, is available at Swansboro and Fulcher's Landing. Channel-bass fishing occurs from beaches and at inlets. Large-mouth bass, bream, and perch are found in New River and tributaries, White Oak River, Wallace Creek, and Frenchs Creek. Northeast Creek and Catherine Lake (about nine miles northwest of Jacksonville) contain bass and jackfish, and bass and bream, respectively.

Pasquotank County

Recreational Facilities - Although not a resort-community, Elizabeth City is a convenient base for hunters, fishermen, and vacationists who can gain access to the duck-hunting Currituck Country, the game-hunting Dismal Swamp Country, sport-fishing waters, and historic and resort spots along the coast. It is also a popular stop on the Ocean Highway (U. S. 17) and the Atlantic Intracoastal Waterway. In October, the annual National Mothboat Regatta is held on the Pasquotank River at Elizabeth City. The fresh water and good wharfage make the city's harbor popular as a winter lay-up for boats. Golf, tennis, boating, swimming, and riding are available at Elizabeth City.

Fishing - Speckled perch and pike are available in Pasquotank River during April, May, and September. Fishing also occurs on Little River and tributaries. Rockfish (striped bass), etc., are caught in Albemarle Sound. Waterfowl-hunting occurs in Dismal Swamp.

Perquimans County

Recreational Facilities - There are no organized recreational facilities. The waters in and around the county, however, offer opportunities for fishing, boating, and swimming.

Fishing - Large-mouth bass, perch, crappie, sunfish, and shad are available in Perquimans River, Yeopim River, Skinners Creek, and Suttons Creek.

Tyrrell County

Recreational Facilities - Pettigrew State Park (Lake Phelps) has boats for rent. Fishing occurs, but the lake is not suited for swimming because of the growth of vegetation in the water. (See information hereinafter in this chapter under "National and State Parks".) Clubhouses, hunting lodges, a small hotel, and tourist homes are available at Atkinson Island, Alligator River.

Fishing - Excellent bass, rockfish, etc., are available in Alligator River, Scuppernong River, Albemarle Sound, and The Frying Pan, a tributary of Alligator River. The last of these four waters are highly recommended for fishing. Cabins and boats are available at East Lake in Dare County, reached by a free ferry from the terminus of U. S. Highway 64 in Tyrrell County at Sandy Point. This highway continues in Dare County mainland and to Manteo on Roanoke Island.

Recreational Facilities - Most of Pettigrew State Park lies in Washington County (see information indicated, and referred to, above under "Recreational Facilities - Tyrrell County). It is planned to develop over-night accommodations at the park. Boating and swimming are available at Albemarle beach and several other beaches on Albemarle Sound.

Fishing - Lake Phelps and Scuppernong River contain bass, perch, and crappie, and bass and rockfish, respectively. The best season for this fishing occurs in November.

NATIONAL SEASHORE RECREATIONAL AREA, NATIONAL HISTORICAL SITE, NATIONAL MEMORIAL, AND STATE PARKS

Cape Hatteras National Seashore Recreational Area - This area (authorized by Congress in 1937 and dedicated in 1958) is comprised of about 28,000 acres of land on Bodie, Hatteras, and Ocracoke Islands (Outer Banks between the Village of Whalebone, Dare County, and Ocracoke Inlet on the Carteret-Hyde County line), and is administered by the National Park Service, U. S. Department of the Interior. Most of this area is to remain in its natural state, but accessible for public use.

Developed areas in the Area are designed for day use or camping; overnight accommodations and restaurants are provided by private enterprise in island villages excluded from the Area. Visitor-facilities on Bodie Island, Dare and Currituck Counties, are Coquina Beach, with bathhouses and picnic area; a camping area on the beach, a Museum of Natural History at Bodie Island Lighthouse, and a Marina at Oregon Inlet. On Hatteras Island, there are two camping areas - one just south of Oregon Inlet and the other at the point of Cape Hatteras; paved parking turn-outs from which visitors can walk to the beach for surfcasting and swimming; and a Museum of the Sea near Hatteras Lighthouse. The Lighthouse itself-like those at Bodie and Ocracoke-is operated by the U. S. Coast Guard. It is open to visitors daily. There is a visitor center, with camping area, on Ocracoke Island. Park headquarters are on Bodie Island. Rangers are on duty here and elsewhere within the Area.

Within the Seashore Recreational Area is Pea Island National Wildlife Refuge, comprised of about 5,880 acres which are under the jurisdiction of the U. S. Fish and Wildlife Service. Extending from Pamlico Sound to the Atlantic Ocean for about 13 miles south of Oregon Inlet, the Refuge is accessible to motorists via the State highway from Oregon Inlet to Cape Hatteras. The Refuge is carefully protected as a haven and feeding ground for many species of birds. An important way-station on the Atlantic Flyway, it is at a point where several heavily-traveled lanes of waterfowl-traffic converge. Between 8,000 and 10,000 Greater Snow Geese can be seen at the Refuge between early November and January 5. Canada geese and many species of duck also winter at Pea Island which, at various seasons, is host to about 34 species of shore birds and to terns, gannets, loons, herons, bitterns, songbirds, and others. Wildlife photography is encouraged. A paved-walkway, atop one of the dykes impounding fresh-water ponds, gives access to the Refuge's remarkable opportunities for "bird watching". Detailed information about the Refuge can be obtained at the headquarters of the U. S. Fish and Wildlife Service on Hatteras Island.

Fort Raleigh National Historical Site - On the northern end of Roanoke Island, the scene of Sir Walter Raleigh's ill-fated attempts to establish permanent English colonies in America, is marked by Fort Raleigh National Historical

Site. Like the Cape Hatteras Seashore Recreational Area, it is maintained by the National Park Service. Fortifications, erected at the Site by the first settlers in 1585, have been restored. A small group of log-and-thatch buildings have been recreated to typify the homes of the settlers whose disappearance from the Site between 1587-1590 is one of history's most baffling mysteries. The second band of settlers, known as "The Lost Colony", arrived at Roanoke Island in July 1587, headed by Governor John White. In August, Governor White's daughter, wife of Ananias Dare, gave birth to a daughter, Virginia, the first child born of English parentage in the New World. Governor White returned to England for supplies but, because of war with Spain, Queen Elizabeth felt that no ships could be spared for the relief of the colony until 1591. When Governor White returned to Roanoke Island, he found that the colony had disappeared, their homes had been taken down, and the word "Croatan" had been carved on a tree. He concluded that they had fled to Croatan Island (now Ocracoke Island), but no trace of them was ever found there or elsewhere.

At Waterside Theatre, adjoining Fort Raleigh, Paul Green's famous, outdoor symphonic-drama "The Lost Colony" is played each summer. Oldest of all the outdoor dramas in America and forerunner of this drama form as established, "off-Broadway" theatrical-fare, "The Lost Colony" was first produced in 1937 and has been interrupted only during World War II, when the coast was blacked out.

Fort Raleigh was designated as a national historic-site in 1941. The fort was explored archeologically in 1947-48 and was restored in 1950. Objects discovered in the excavations, are displayed in a small museum at the Site.

Wright Brothers National Memorial - Each December 17, the Memorial, near Kitty Hawk and Kill Devil Hills, Dare County, is the setting for ceremonies marking the anniversary of powered flight. It was on December 17, 1903 that Wilbur and Orville Wright, in the fragile "flying machine" known as the "Kitty Hawk", left the ground and completed the four, short trips which opened the Aviation Age.

The site of the first, successful power-driven flight in history is marked by Wright Brothers National Memorial, visited by thousands of people each year. The area of the Memorial contains over 300 acres and includes the tall sand-dune from which the Wright brothers launched gliders, the spot where the "Kitty Hawk" left the ground for the first time, and restorations of the brothers' crude hangar shop, and living quarters.

Dominating the area is Wright Memorial Monument, a triangular pylon of gray granite, 60 feet high, atop the highest of the dunes known as the Kill Devil Hills. The polished steel-doors of the shaft of the Memorial lead into a rotunda containing a metal world-map, which depicts events associated with man's efforts to fly and the first 25 years of aviation history. Stairs lead to an observation platform at the top. Before the shaft could be built, the shifting dune was "anchored" by the planting of tough grasses. A paved driveway, with parking spaces, circles the dune, and paved pathways lead up to the shaft of the Memorial.

At the Aviation Anniversary celebration on December 17, 1957, ground was broken for a new visitors' center and museum near the monument, and the National Park Service announced plans for a new landing-strip for light aircraft and new access-roads connecting the Memorial with U. S. Highway 158.

Just north of the monument is a large granite-boulder marking the take-off point for "Kitty Hawk". Small metal-markers designate the landing points for the first four flights. Two wooden buildings nearby, added in 1953, duplicate the Wright Brothers' 1903 camp.

The Memorial is open to visitors year-around during daylight hours, and the monument is floodlighted until 10:00 p.m. each night.

At a few miles north of the Memorial is the Village of Kitty Hawk which the Wright Brothers first visited in 1900. The site of their first glider-experiments at Kitty Hawk is marked by a small marble-shaft erected by the citizens of the village in 1928. Establishment of Wright Brothers National Memorial (Known as Kill Devil Hills National Memorial until 1953) was authorized by act of Congress in 1927, and the Memorial Shaft was completed in 1932.

On the Hatteras Highway near the Village of Hatteras is a North Carolina historical marker installed in 1953. It reads: "Billy Mitchell, Brigadier General of the Army Air Service, demonstrated air power by bombing battleships off coast September 5, 1923. Landing field was here."

Fort Macon State Park - Located in Carteret County, across Bogue Sound from Morehead City and Beaufort, Fort Macon is easily accessible over a highway bridge from Morehead City at Atlantic Beach and a paved road on Bogue Banks from Atlantic Beach about three miles east to Fort Macon. Mailing Address: Fort Macon State Park, P. O. Box 127, Atlantic Beach, North Carolina. Telephone: Morehead City 6-3775.

Fort Macon State Park, bounded by the Atlantic Ocean on the south and Bogue Sound on the north, is on the barrier beach of Bogue Banks and extends about two miles westward from Beaufort Inlet. Within the park is historic Fort Macon, a hundred-year-old masterpiece of architectural beauty, seized by the Confederate forces in April 1861 and captured by the Union forces on April 26, 1862. Since early Colonial days, the location of the present fort has been the site of fortifications for the protection of Beaufort Inlet.

No less interesting is the natural beauty of Fort Macon State Park. The high dunes, covered with the waving plumes of sea oats, old cedar trees picturesquely shown by the winds, live oaks, red-berried yaupon, the green marshes along Bogue Sound, and the ceaseless breaking of the ocean on the beach are all a part of a coastal area of unusually-high scenic values.

The Park is populated by a host of shore birds including gulls, terns, pipers, and the like.

Fort Macon State Park, established in 1924 by transfer from the Federal Government, was the second North Carolina State Park to be acquired. It was established and maintained for the three-fold purpose of protecting and preserving natural and scenic values, protecting and preserving Fort Macon, and providing recreational use of natural resources.

Swimming - Modern bathhouse, boardwalk, and protected swimming area in the Atlantic Ocean. Open about June 1 through Labor Day. Fishing - Surfcasting in ocean and sound from shores of park. Picnicking - Picnic area equipped with picnic shelter, tables, and benches, outdoor fireplaces, water and toilets. Refreshment Stand - Cold drinks, sandwiches, candies, cigarettes, etc., for sale near bathhouse and picnic area from about June 1 through Labor Day. Hiking - Over sand dunes or along ocean shore. Nature Study - Excellent opportunity for study of bird, seashore, and plant life. Historic Structure - Old Fort Macon partially restored. Museum in fort. Park Roads and Parking Areas - Paved park-road system to all developed public-use facilities. Paved parking-areas at the fort and near bathhouse and picnic area.

Pettigrew State Park - Located in Washington and Tyrrell Counties on the shores of Lake Phelps, nine miles south of Creswell, Washington County, on U. S. Highway 64 between Plymouth and Columbia. Accessible over paved road from Creswell. Mailing Address: Pettigrew State Park, Creswell, North Carolina

Pettigrew State Park, named in honor of General James Johnston Pettigrew, Civil War hero who is buried just outside of the Park, is on the shores of Lake Phelps in the historic Albemarle section of the low, level Coastal Plain.

The park is located on portions of two fine, old plantations, "Bonarva" and "Somerset Place", which flourished from the late 1700s until the Civil War. Somerset Place was established about 1787 by Josiah Collins and two associates. Josiah Collins had emigrated to the United States from Somertshire, England, and, after brief residences in Boston and Halifax, North Carolina, had settled in Edenton where he established a thriving mercantile and shipping business and a prosperous rope-walk. Bonarva Plantation was established about 1789 by Charles Pettigrew who was the first Bishop-elect of the Episcopal Church of North Carolina. To bring these and the other plantations in the vicinity to full cultivation, many miles of canals had to be dug to convert the swampy land into fertile fields. The canals, all dug by slave labor, are still in existence. Chapter 659 of 1955 Session Laws, General Assembly of North Carolina, provided that unexpended funds, theretofore appropriated as part of the permanent improvements appropriation for the Pettigrew State Park, may be expended for drainage of the overflow waters from Lake Phelps (six drainage canals connecting the lake and Scuppernong River) on the basis of matching dollar-for dollar funds made available for this purpose locally as provided in the Act or any funds, made available from the State Contingency and Emergency Fund for this purpose, may be so expended on the same dollar-for-dollar matching basis, but in no event shall the total expended by the Department of Conservation and Development exceed $25,000.00. Two contracts for drainage of the said overflow waters were let on this basis during the latter half of 1957.

Among the remaining buildings in Pettigrew State Park is the manor of Somerset Place. This house, an interesting example of Greek Revival architecture as it was adapted to Eastern North Carolina, was built on the shore of Lake Phelps by Josiah Collins III in the early 1830s. The Pettigrew House, Bonarva, begun in 1789 by Charles Pettigrew and enlarged by Ebenezer Pettigrew, was burned in 1860.

State-owned Lake Phelps, one of the most beautiful of North Carolina's natural lakes, adds greatly to the natural beauty of the park. A magnificent cypress-growth along the lake shore is not the least of the attractions that await the visitor. These great old trees, which have seen the rise and decline of the large plantations, form a most attractive setting for the lake which has long been an angler's paradise. In the 16,600-acre lake, second-largest natural lake in the State, black bass and panfish abound.

Boating - Boat pier and launching site for boats. Row boats for rent. Fishing - Excellent panfish and bass fishing in Lake Phelps. Historic Structures - Somerset Place manor house, and other buildings and features of Somerset Place. The grounds, walks, drives, some of the buildings, and part of the gardens have been restored.

Brunswick Town State Historical Park - Located in Brunswick County on Cape Fear River, 16 miles south of Wilmington, on N. C. Highway 130. It is adjacent to the famous Orton Plantation (See hereinbefore in Chapter I of this publication under "Brunswick County").

The Park has not yet been developed or restored. Within its 119 acres is the Site of the old Town of Brunswick, located on the west bank of Cape Fear River and established in 1725. During a considerable number of years, it was the leading seaport of that area. The port of Wilmington, founded later, further up and on the east bank of the river, sapped the life of Brunswick, and the town never grew to any extent. It was partly burned by the British during the Revolutionary War and eventually disappeared altogether. The walls of historic St. Phillips Church remain.

James Iredell House State Historical Park - The Park is located in the City of Edenton, covers 1.5 acres, and includes the Colonial home of James Iredell, born 1751 at Lewes, England. James Iredell studied law with Samuel Johnston and, in 1790, was appointed Associate Justice of the Supreme Court of the United States at the age of 38. He died on October 20, 1799 at Edenton. The James Iredell House is kept open to the public by the James Iredell Historical Association, Inc., under agreement with the State Department of Conservation and Development.

Only one gaging station, New River near Gum Branch, Onslow County, is operated, under the cooperative agreement between the Geological Survey, U. S. Department of the Interior, and the North Carolina Department of Conservation and Development, in the river basins included in this publication. "Geological Survey Water-Supply Paper 1273" provides information regarding this station for the water year beginning October 1, 1952 and ending September 30, 1953. Data contained in this paper and in records of the North Carolina Department of Conservation and Development are set forth below.

New River near Gum Branch, Onslow County

Location - Lat. 34°51'05", long. 77°31'05", on right bank 5 feet downstream from county highway bridge, 0.5 mile downstream from Jenkins Swamp, 1.75 miles southwest of Gum Branch, and 3.75 miles southwest of Richlands.

Drainage area - 74.5 square miles.

Records available - August 1949 to date.

Gage - Water-stage recorder. Datum of gage is 3 feet above mean sea level (Corps of Engineers benchmark). Prior to Mar. 22, 1950, a staff gage was operated at the same site and datum.

Extremes

Maximum discharge, water year 1952-53: 668 c.f.s. on Feb. 9 (gage height: 8.76 feet).

Minimum discharge, water year 1952-53: 3.2 c.f.s. on Sept. 19 and 20 (gage height: 0.67 foot).

Maximum discharge - 3,120 c.f.s. on July 1950 (gage height: 16.16 feet), from rating curve extended above 2,400 c.f.s.

Minimum discharge - That of Sept. 19 and 20, 1953.

Maximum stage - Flood of 1908 reached a stage of 18.16 feet, from information furnished by local resident.

Remarks - Records fair.

	1950	1951	1952	1953	1954	1955	1956
Maximum daily discharge, m.g.d.	1820	355	704	401	236	4190	444
Maximum daily discharge, c.f.s.	2820	550	1090	620	366	6490	687
Minimum daily discharge, m.g.d.	9.0	3.23	2.91	2.13	1.23	2.26	4.20
Minimum daily discharge, c.f.s.	14	5.0	4.5	3.3	1.9	3.5	6.5
Maximum mean weekly discharge, m.g.d.	872	168	247	246	138	1410	266
Maximum mean weekly discharge, c.f.s.	1350	260	383	381	214	2180	411
Minimum mean weekly discharge, m.g.d.	12	4.13	3.55	2.78	1.29	3.01	4.65
Minimum mean weekly discharge, c.f.s.	18	6.4	4.5	4.31	2.00	4.66	7.2
Mean monthly discharge, m.g.d.	79.5	30.9	42.7	45.2	32.2	109	51
Mean monthly discharge, c.f.s.	123	47.9	66.1	69.9	49.9	169	78.6

CHAPTER VI - GROUND WATER

"Progress Report on Ground Water in North Carolina by A. J. Mundorff, Bulletin 47, North Carolina Department of Conservation and Development", prepared in cooperation with the Geological Survey, U. S. Department of the Interior, contains the following information regarding ground water in the Coastal Plain River Basins.

General - Ground water is one of the most valuable natural-resources in North Carolina. Approximately 2,400,000 people, or 70 percent of the total population of the State (1945), depend upon ground water for their water-supply. Probably more than 99 percent of the rural population use water from wells or springs, and approximately 400,000 people are supplied with ground water by municipalities and military establishments. The total population of the State in 1950 was 4,061,929, and the total population of the State, living on farms, in 1951 was 1,457,428. Based on these figures, approximately 54 percent and 46 percent of the people of the State are supplied with surface water and ground water, respectively.

Of the several million dollars a year spent in obtaining ground water for the people, a considerable part is spent in digging, boring, and drilling new wells. It is unfortunate that part of this money is used unnecessarily because of inadequate knowledge of the ground-water conditions.

Geology and its relation to ground water - There is a very close relationship between the geology of an area and the quantity and quality of water that can be obtained from wells obtained in the area. Therefore, an understanding of the fundamentals of geology and the principles of the occurrence of ground water are of great value in estimating the ground-water possibilities of a locality and in choosing the best location for drilling.

The principal source of ground water is precipitation as rain or snow. The water can enter and move, through the soil and unconsolidated rocks, only through the openings between the sand grains and clay particles, and can enter and move, in harder-consolidated rocks, only through fractures and joints. Ground water moves because of gravity, and the point of its discharge from the ground is always at a lower level than the point at which it entered. Entry occurs in areas between streams, and the natural discharge is into streams, swamps, and the sea. Rain, falling on the surface of the ground, percolates vertically downward through the earth until it reaches the zone of saturation below which the pores and openings of the rock are completely filled with water. The upper surface of the zone of saturation is called the water table and, in North Carolina, generally is from a few feet to about 100 feet below the land surface. Discharge of ground water is a continuous process so that the ground-water levels are receding, except during and immediately following a period of rainfall at which time the ground-water supplies are replenished. For these reasons, the water table is not a fixed surface but is continually fluctuating.

The amount of water in an aquifer (water-bearing rock) depends upon the porosity of the rock. The ratio of the volume of a rock, which is occupied by pores or other openings, to the total volume of the rock is its porosity and is stated as a percentage. Natural rock-materials differ greatly in porosity. The porosity of unconsolidated rocks, such as sand, clay, and gravel, commonly is from 25 to 50 percent. The porosity of consolidated rocks is much less and is mainly in the joints, fractures, and solution channels.

A rock may have a large porosity and yet yield little water even though allowed to drain for a long time. A clay, for example, with a porosity of 50

percent, might not yield any water because of the smallness of the pores, the water being retained because of molecular attraction. The ratio of the volume of water, which a saturated rock will yield by gravity, to the total volume of the rock is called the specific yield and is stated as a percentage.

Porosity and specific yield are important properties of an aquifer. Permeability, the rate at which the water can be transmitted through the rock, is, however, its most important water-yielding characteristic. The permeability of an aquifer depends upon the size and arrangement of its pores. In clays, the pores are so small that water will be transmitted very slowly through the clays. A clean sand of moderate texture will transmit, and therefore yield, water relatively rapidly.

In rocks such as granite, slate, schist, gneiss, and some sandstone and shale, water moves along bedding planes, joints, and cleavage planes so that the amount of water, which such rocks will yield, depends on the size and number of these openings.

As rain is practically free of mineral matter, the mineral content of ground water depends on the minerals which are dissolved as the water percolates through the rock. Therefore, the mineral content of water is largely determined by the kind of rock through which it moves and by the length of time it is in contact with soil and rock.

Formations of the Coastal Plain - These formations are very different from those of the Piedmont and Mountain sections of the State. In contrast with the hard, crystalline rocks of those areas, the formations of the Coastal Plain consist of unconsolidated and semi-consolidated sediments deposited in and along the margin of a sea that once covered the eastern part of the State.

Geological History - At the beginning of Cretaceous time, the land had been worn down to a plain of low relief. The rocks were deeply decayed, and a thick layer of weathered material covered the surface. At this time, the land began to be tilted gently to the southeast, so that eastern North Carolina was covered by a shallow sea which extended far up the broad valleys that had been developed in the crystalline rocks. The weathered and decayed material, to the west, was carried southeastward and deposited in the stream channels and adjacent flood plains, in the bays and estuaries, and along the sea margin, resulting in the basal sand and clay strata of Cretaceous age. As these broad valleys were filled, subsidence continued so that, in later Cretaceous time, the land waste was carried into the sea, forming the marine deposits now known as the Black Creek and Peedee formations. At the end of later Cretaceous time, the land was elevated relative to sea level so that a long period of erosion removed much of the material previously deposited.

In lower Eocene time, the sea again encroached on the land, but only a few remnants of the sediments deposited in it have been found, and these are at relatively-high levels along the western edge of the Coastal Plain. However, evidence of the presence of sand and clay strata of lower Eocene age, beneath the Miocene Yorktown formation in northeastern North Carolina, has recently been discovered.

In later Eocene time, the limestones and calcareous sands of the Castle Hayne marl were deposited in southeastern North Carolina uncomformably overlying the uppermost Cretaceous-deposits. The Castle Hayne marl is not known to overlie the earlier Eocene deposits, although it may do so in Beaufort County.

The Coastal Plain of North Carolina appears to have remained above sea

level in Oligocene time but, in lower Miocene time, the sea again trangressed on the land, and the Trent marl was deposited uncomformably over the Castle Hayne.

In later Miocene time, a more extensive submergence occurred, and the sea extended completely across the present Coastal Plain in the northern part of the State and most of the way across in the southern part. The formations of this period include the Yorktown in the north and the Duplin marl in the south.

Marine Pliocene deposits are found along the coast, but most of the Coastal Plain remained above sea level during this period.

In Pleistocene time, the sea rose to as much as 270 feet above its present level. The sea withdrew and advanced a number of times thereafter and, at each successively-lower stand, formed a terrace, just as a terrace is being formed at the present time along the coast.

Structure of Formations - The basal cretaceous beds extend from the northern to the southern boundary of the State in an irregular belt immediately east of the Fall Zone separating the Piedmont Plateau and the Coastal Plain and passing through or near Weldon, Rocky Mount, Wilson, Smithfield, Fayetteville, Raeford, and Rockingham.

Eastward, the basal Cretaceous beds pass beneath the Black Creek formation which, in turn, is overlain by the Peedee formation still farther to the east. The Black Creek and Peedee formations, of Upper Cretaceous age, extend southward beyond the South Carolina line but are not known to extend northward much beyond Greenville.

In the northeastern part of the Coastal Plain, strata of lower (?) Eocene age probably unconformably overlie the Cretaceous formations. These Eocene strata are not known to crop out in North Carolina. They apparently form a wedge thickening to the northeast from Pitt and Beaufort Counties. To the south, the Peedee formation dips to the southeast beneath the Castle Hayne marl of Eocene age, which forms a belt extending, in a north-south direction, from the Neuse River, between Goldsboro and Fort Barnwell, to the south of Wilmington. The Peedee formation, in turn, is overlain, to the east, by the Trent marl of Miocene age.

The upper Miocene formations were deposited on the erosion surface which beveled all other formations. The Yorktown formation underlies practically the entire Coastal Plain north of the Neuse River, extending from the Fall Zone to the coast. For a distance of 20 to 30 miles eastward from the Fall Zone, the dip is about the same as the slope of the land surface, so that the thickness in this area is fairly uniform. Beyond this point, however, the dip becomes progressively greater. South of the Neuse River, the Duplin marl, which apparently is the same age as the upper part of the Yorktown formation, overlies the Trent marl and is, in turn, overlain by the Croatan sand of Pliocene age. Further south the Duplin marl occurs in thin, isolated patches as far inland as Lumberton.

The Pleistocene terraces form a blanket, usually about 20 or 30 feet thick, over all the formations mentioned above and extend westward onto the crystalline rocks in the Fall Zone.

Yields of Coastal Plain aquifers - In contrast with the Piedmont section, most parts of the Coastal Plain will yield large quantities of water to wells. Supplies of several million gallons a day can be obtained at many places, and adequate supplies for most industrial uses can be obtained at almost any place in the

Coastal Plain except along its western margin. A considerable number of wells have been drilled that yielded 1000 or more gallons a minute, and many others, which were tested at 300 or 400 gallons a minute with a drawdown of only a few feet, undoubtedly would yield several times their tested capacity.

Because the amount of water withdrawn from the Coastal Plain has been small compared to the amount available, little attention has been given to the perennial yield. Very few data are available regarding permeability of the formations, amount of recharge, or fluctuations of the water level.

Annual recharge in the eastern United States has been estimated as about one-third of the precipitation. As rainfall averages about 45 inches in the North Carolina Coastal Plain, this annual recharge would be about 15 inches and would be equivalent to about 700,000 gallons a day for each square mile. As the porosity of the soils of the Coastal Plain is considerably greater than the average for the eastern United States, it is possible that the recharge in this area may be closer to 1,000,000 gallons a day for each square mile. Because of losses through transpiration and evaporation and from discharge to streams, only a part of this recharge is recoverable.

Although the yield of the deeper aquifers is determined by the transmissibility, which might be so low that part of the recharge would be rejected by these aquifers, the part rejected could be recovered from the surficial Pleistocene sands that practically blanket the Coastal Plain. Thus, the total, potential water-supply, in the North Carolina Coastal Plain, is determined principally by the amount of recharge and is probably several billion gallons a day.

At many places, several million gallons a day can safely be removed from a small area, provided pumpage in adjacent areas is light, although probably not more than 500,000 gallons a day could safely be withdrawn per square mile, if each square mile were being pumped over a large area.

Permeabilities of the materials in the Coastal Plain vary greatly. The coefficient of permeability is defined as the number of gallons of water transmitted, perpendicular to the direction of flow, in one day through a section of the aquifer one mile long and one foot thick, under a hydraulic gradient of one foot per mile. Thus, an aquifer, that is 50 feet thick and has a hydraulic gradient of 10 feet per mile and a coefficient of permeability of 500, will transmit 250,000 gallons of water daily through a section one mile long. The coefficients of permeability of a few samples of sand have been determined, and these coefficients ranged from about 40 to 2200. The coefficients of some sands and gravels in the Coastal Plain probably are even higher. Some limestone and shellrock strata also are exceedingly permeable, but the clayey sands and clays have little or no permeability.

Ground-water conditions in the unit-areas in the Coastal Plain - Unit area I is the northeastern part of the Coastal Plain. It includes Currituck, Camden, Pasquotank, Perquimans, Chowan, Dare, Tyrrell, Washington, Hyde, and Pamlico Counties; most of Beaufort County; most of the northern part of Craven County; the eastern half of Gates County; and most of the eastern part of Bertie and Martin Counties. The Yorktown formation extends to 400 or more feet below the surface along the western edge of this area. Little information is available regarding its depth and thickness near the coast, but the base of the formation is probably 600 or more feet below the surface. Below it are Eocene and Cretaceous strata, but these formations generally cannot be used as a source of supply because the water has too high a salt content.

The Pliocene and Pleistocene deposits furnish good supplies in some

places, some wells less than a hundred feet deep yielding 250 gallons a minute. Elizabeth City obtains its water by using a large number of shallow gravel-packed wells (see Chapter II hereinbefore). The Yorktown formation will furnish large amounts of water, and yields of 1,000 gallons a minute probably can be obtained at many places. However, brackish water underlies the area so that, in some places, the water from this formation cannot be used. Some of the deeper wells, near the southern boundary of Unit-area 1, end in sand and shell rock which may belong to the Castle Hayne or Trent marls. The yields of these wells usually are large.

The water in this area is usually moderately hard to very hard, and the iron content, especially in the shallower beds, is apt to be high.

Unit-area 2 comprises Carteret and New Hanover Counties; the greater parts of Brunswick, Pender, Onslow, and Jones Counties; and most of the southern part of Craven County. The limestone and calcareous sandstones of the Castle Hayne and Trent marls are at or near the surface through most of the area, the Peedee formation underlying them at shallow depths along the western margin with the depth to it increasing eastward at the rate of 15 to 20 feet per mile.

Very large amounts of water are obtained from the limestones and shell-rock strata of the Castle Hayne and Trent marls. Wells, which will yield 50 to 100 gallons a minute for each foot of drawdown, are not uncommon. However, the water is nearly always hard. In some places, large quantities of water can also be obtained from the calcareous strata of the upper part of the Peedee formation. This water is also hard. The deeper sand-strata, in the Peedee formation, contain softer water and will probably furnish moderate supplies. In some places, however, this water is brackish. In a few places, especially in the northeast corner of the area in Craven and Carteret Counties, some of the wells obtain satisfactory supplies of water from the Duplin marl or Yorktown formation.

Unit-area 3 includes most of Gates, Hertford, Northampton, Bertie, Halifax, Martin, Edgecombe, and Pitt Counties, and parts of Beaufort, Wilson, Greene, Craven, and Lenoir Counties. Unit-area 4 includes most of Lenoir, Wayne, Duplin, and Hoke Counties; all of Sampson, Cumberland, Bladen, Robeson, Columbus, and Scotland Counties; and parts of Craven, Greene, Johnston, Harnett, Richmond, Brunswick, Onslow, and Jones Counties. Since most of these two unit-areas lie in large Coastal Plain River Basins (Roanoke, Tar, Neuse, Cape Fear, and Pee Dee), which are not included in the Coastal Plain River Basins covered by this publication, the ground-water-yielding characteristics of these unit-areas are not set forth herein.

Quality of Ground-Water in the Coastal Plain - Five important chemical constituents and characteristics - chloride, iron, fluoride, hardness, and corrosiveness - affect the quality of ground water, some of which cause serious problems in the Coastal Plain.

Chloride content - The chloride considered here is largely present as sodium chloride, or common salt. The usual chloride-content of uncontaminated surface-water and shallow ground-water ranges from a few parts per million along the Fall Zone to as much as 40 parts per million along the coast. The higher chloride-content along the coast is probably caused by ocean spray being carried inland by the wind.

The U. S. Public Health Service recommends that the chloride content of public water-supplies should preferably not exceed 250 parts per million where other and more-suitable supplies are available. Water, with that amount of

chloride in the form of sodium chloride, has only a very slightly salty-taste. At a concentration of about 500 parts per million, a salty taste is generally noticeable, and it is doubtful whether water, with more than that amount of chloride, would be generally acceptable except for short periods. A considerable number of towns, cities and industries in North Carolina use water with a chloride content of 250 to 500 parts per million.

Water, with an abnormally high chloride-content, originates in two general ways: first, as water that was trapped in the sediments at the time of their deposition or entered them during a later submergence and, second, by contemporaneous contamination from a nearby underground or surface body of salty water.

Chloride contamination - In a few wells, the chloride content has increased as the well was pumped. One way, in which this contamination can occur, is by lateral encroachment from a nearby body of salty water. Conditions, which must be present to permit contamination of a well by lateral encroachment are: (1) a nearby body of salty water, (2) access of the salty water to the strata from which the wells are drawing, and (3) extension of the cone of depression to the body of salty water, so that a gradient is established from it to the wells. Contamination has occurred, in this way, in the wells supplying the City of New Bern and in industrial wells at Wilmington.

A second way, in which the chloride content will increase with pumping, is by contamination from below. A lens of fresh water, floating on salt water on an island or bar, will theoretically extend about 40 feet below sea level for every foot that the water table is above sea level. If the water table is two feet above sea level, then salt water will not be encountered until 80 feet below the surface. However, if a shallow well is pumped sufficiently to lower the head on the fresh water to sea level, then the salt water will rise or "cone" up beneath the well. Contamination can also occur in this way along the beach as well as on islands and bars. It is probable that contamination has occurred, in this way, in some shallow domestic-wells along the coast of North Carolina although none had, in 1945, been reported to the Geological Survey, U. S. Department of the Interior, or the North Carolina Department of Conservation and Development.

An abnormal chloride-content can also be caused by pollution from organic sources. The high chloride-content is, in that case, usually accompanied by high nitrates. A considerable number of shallow wells, in populated areas, have shown indications of such pollution.

Hardness - Hardness in water is due to the presence of certain compounds of calcium and magnesium, usually the carbonates, bicarbonates, and sulfates, and occasionally chlorides or nitrates. Hardness of water is objectionable because it destroys soap, thus requiring a large amount to produce a lather and because of the scale formed by the precipitation of the minerals on the walls of any container in which the water is heated.

Hardness of the ground water in the Coastal Plain of North Carolina is usually due to the solution of calcium and magnesium carbonates by the water as it percolates downward through calcareous sediments. Occasionally, part of the hardness is due to sulfates and rarely to chlorides or nitrates. Usually, when sulfate is present in sufficient amount to cause any appreciable amount of hardness, the chloride content is also above normal. The source of the sulfate and chloride in such waters is, evidently, connate water, comprising sea water that was trapped in the sediments at the time of their deposition.

In some parts of unit-areas 1 and 2, indicated hereinbefore in this chapter, the shallow water is as hard as the deep water. Wells, ending in the calcareous Eocene and Miocene formations (Yorktown, Castle Hayne, Trent, and Duplin), usually yield hard water as do wells ending in calcareous phases of the Peedee and Black Creek formations (later Cretaceous time). Wells, in the basal Cretaceous Strata (early Cretaceous time), will yield soft water, except from the upper part in areas where it is overlain by the Yorktown formation. In these areas, the water is hard when it leaves the Yorktown formation but, as it travels downward through the Cretaceous sands, base-exchange materials replace the calcium and magnesium of the bicarbonate with sodium, thus effecting a natural softening of the water, so that deeper wells will yield softer water.

Iron - Some wells, in nearly every part of the Coastal Plain, yield water with objectionable amounts of iron, and it is probable that objectionable amounts of iron impair the value of more ground-water supplies than all other chemicals combined. The principal objection to the presence of iron is that it causes staining of enameled ware and other utensils, bathroom fixtures, and clothing. The maximum amount of iron and manganese together, permissible in public water-supplies, is 0.3 part per million according to the U. S. Public Health Service. However, water with 0.2 part per million may cause some staining.

Iron, in some form, is present in practically all soils and rocks and may be dissolved by ground water. The presence of iron in ground water is seemingly quite erratic and, of two wells only a few hundred yards apart and about the same depth, one will have a high iron content whereas the other will have little or no iron. Generally, the deeper water has a lower iron-content than the shallow water.

Iron can be removed quite simply in a water-treatment plant and, therefore, presents no insurmountable problem to the larger municipalities. Treatment is relatively more-expensive for small municipalities and industries, and is especially more-expensive for domestic supplies of ground water.

Corrosiveness - Oxygen and carbon dioxide are the principal constituents of ground water causing corrosion. Shallow ground-water usually is much more corrosive than the deeper water. As the water percolates downward, the oxygen is quickly used up in oxidation of organic and inorganic materials. The carbon dioxide commonly reacts with carbonates to form bicarbonates. Because of this reaction, hard water is generally less corrosive than water of low mineral-content and hardness.

Corrosion causes deterioration of the well casing, pump pipes, pumps, tanks, and water pipes in the distribution system. However, the deterioration is not as objectionable as is the presence of the iron which is dissolved, causing "red water" that stains utensils, plumbing fixtures, and the laundry. It is not always apparent whether the iron is in the water when it enters the well or whether it has been dissolved by corrosion of the well casing and pipes. The problems of iron and corrosiveness in ground water are closely related and are serious problems for domestic and small municipal and industrial users in the Coastal Plain.

Fluoride - The presence of this chemical in water, in excess of about one part per million, may cause the dental defect known as mottled enamel, if the water is used for drinking and cooking during the formation of the teeth. According to Dr. H. T. Dean, of the U. S. Public Health Service, the teeth will erupt showing a dull, chalky-white appearance, later taking on a brown stain. The surface of the teeth may also be marked by pitting. Dr. Dean states that the mildest forms of mottled enamel will develop in about ten per cent of the children

who continually use water with a fluoride content of about 1 part per million. The severity and percent of incidence increase markedly with an increase in fluoride content until, at 6 parts per million, an incidence of 100 per cent is not unusual, and a large percentage of cases are classed as moderate or worse. Mottled enamel is a permanent physical disfigurement. It is the teeth of children, only, that are affected. Normally-calcified teeth do not become mottled later, regardless of the fluoride content of the drinking water.

Water containing small amounts of fluoride, however, is reported by Dr. Dean to be beneficial in prevention of dental decay. It has been shown that school children, using water containing about one part per million of fluoride, experience only one-half to one-third as much dental decay as comparable groups using water that contains no fluoride.

Fluoride, in excess of one part per million, was found only in wells, in the Coastal Plain, 100 or more feet deep.

Most of the wells in North Carolina, that yield water high in fluoride, apparently end in the basal Cretaceous deposits, the lower Eocene sands, or the Miocene marl. Phosphatic material, generally considered to be one source of the fluoride in ground waters of the southeastern United States, has not been reported from the basal Cretaceous deposits of North Carolina, but it is not uncommon from the Castle Hayne marl (Eocene) and the Trent marl and Yorktown formation (Miocene). However, it is, apparently, most plentiful in the Castle Hayne (Eocene) and Peedee formation (Upper Cretaceous).

The main area of high fluoride-content in wells extends northeast from near Greenville. It may be that most of the wells, yielding high fluorides in this area, obtain their water from the lower Eocene sands. It is possible, also, that some of them end in the basal cretaceous sands.

Only a few wells, from the Yorktown formation, yield water high in fluoride, and these are in the eastern half of the Coastal Plain where the formation is thick. It may be that the phosphate is confined to the basal part of the Yorktown in the western half; and, as most of the wells in the Yorktown end in more permeable strata above the basal part, most well-supplies in that area are taken from above the phosphatic phases.

Phosphatic material in the strata of the Peedee formation does not always give the water a high fluoride-content. Conversely, it is possible that the fluoride content of the water, at some places, is derived from minerals other than the phosphates.

Water-Bearing Properties of the Coastal Plain Formations

Patuxent (Lower Cretaceous age) and Tuscaloosa (early Upper Cretaceous age) Formations - Since these formations lie to the southeast of the Fall Zone and extend northeastward from South Carolina to Virginia, their properties are not pertinent to this publication. The withdrawals from the aquifers represents only a small fraction of their potential yield.

Black Creek Formation (Upper Cretaceous age) - This formation will, in most places, furnish moderate to large supplies of water. The yield of 31 wells 6 inches or more in diameter, tabulated in Bulletin 47, North Carolina Department of Conservation and Development, ranges from 50 to 860 gallons a minute and average about 245 gallons a minute. The lower yields are from wells supplying small towns which do not need large amounts of water. These wells usually have only a short length of screen, and it is probable that much-larger supplies of water could be

developed, at these places, if they were needed.

The total capacity of all wells, supplying municipalities and military bases from wells drilled into the Black Creek formation, is about 7,500 gallons a minute. Very likely, double that capacity is represented by industrial and domestic wells. The actual pumpage from this formation probably is about half this amount, so that roughly 10,000 gallons a minute or 15,000,000 gallons a day is being withdrawn from the Black Creek formation. This amount represents only a small fraction of the total potential-yield of the aquifer. The potential recharge to the Black Creek formation is probably between 20 and 30 percent of the total rainfall over its area of outcrop.

The water from the Black Creek formation, with the exception of that from wells ending in the Snow Hill marl member, is soft and has a low content of dissolved solids. It sometimes contains considerable carbon dioxide and is corrosive. In a few places, the water contains an objectionable amount of iron.

Peedee Formation (late Upper Cretaceous age) - This formation, at most places, will yield moderately large to very large amounts of water. The shell rock yields very large amounts to ordinary cased-wells. Screened wells in the coarser sand, and gravel-walled wells in the finer sand, also will yield larger amounts. A considerable number of wells, in the vicinity of Wilmington, yield several hundred gallons a minute with only a few feet of drawdown. The gravel-walled well at Burgaw was tested at 150 gallons a minute with a drawdown of three feet. A 10-inch well, drilled at Chadbourn in 1907 for the Independent Ice Company, was tested at 1800 gallons a minute with a rotary pump. This well was 135 feet deep, ending in a coarse sand-stratum in the Peedee.

Bulletin 47, North Carolina Department of Conservation and Development, lists 18 wells that supply municipalities and military bases from the Peedee formation. The yield of these wells ranges from 80 to 300 gallons a minute, averaging about 190 gallons a minute. Most of these wells were tested with centrifugal pumps and had small drawdowns, so that the actual capacity was never even approached. It is probable that some of them would yield 1,000 gallons a minute or more. The 18 wells have a total capacity of 3,500 gallons a minute with probably 2,000 gallons a minute being used. The pumpage of these 18 wells probably is not more than 10 to 20 percent of the total amount withdrawn from the Peedee formation amounting to about 15 or 20 million gallons a day, which is only a small fraction of the total potential-yield.

The water from this formation is usually moderately hard to hard. A few deeper-than-average wells yield soft water which has evidently been softened by base exchange. In some of these wells, however, the increase in sodium-bicarbonate content is accompanied by an increase in chloride, due to the presence of connate water.

Lower Eocene Strata - Since this formation occurs in a few, very small, isolated patches in or near the Fall Zone in Martin, Bertie, Hertford, and Gates Counties, their properties are not pertinent to this publication.

Castle Hayne Marl (Upper Eocene age) - The calcareous members of the Castle Hayne marl have undergone considerable solution so that, frequently, they are very porous and transmit large quantities of water. It is one of the best aquifers in the Coastal Plain, although only a relatively-small amount of water is being withdrawn from it. The 14 wells at Camp Davis, Onslow County, which are 8 inches in diameter, yielded, when first tested, an average of 220 gallons a minute with an average drawdown of 3.3 feet, a specific capacity of 66 gallons a

minute per foot of drawdown. It is probable that most of these wells would yield 1,000 gallons a minute. The wells in the main area at New River Marine Base, which obtain part of their water from the Castle Hayne marl, yield an average of about 220 gallons a minute. A well, drilled for the Town of Jacksonville in 1942, was tested at 300 gallons a minute with a 7-foot drawdown, and a well, at the Auxiliary Air Base near Pollocksville, yields 180 gallons a minute with 8.5 feet drawdown. Three of the wells at Fort Fisher were tested at an average of 260 gallons a minute with an average drawdown of 33 feet.

The average tested-yield of the 32 wells ending in the Castle Hayne marl, listed in Bulletin 47, North Carolina Department of Conservation and Development, is 203 gallons a minute. Most of these wells, however, had a drawdown of only a few feet, so that the actual capacity is much larger. The specific capacity ranges from about 8 to 100 gallons a minute per foot of drawdown. The total capacity of the 32 wells is about 6,500 gallons a minute or nearly 10 million gallons a day. The capacity of all other wells, ending in the Castle Hayne marl, probably is less than this amount and, as the wells are not pumped continuously nor at the tested capacity, the total amount of water, used from the formation, is probably not more than 10 million gallons a day, which is probably less than 10 percent of the total potential-yield.

The water from the Castle Hayne marl is usually hard and sometimes contains objectionable iron. Connate (or intrudent) water, encountered at depth in some places, is nearly-always softer than the non-connate water. This soft connate-water is high in sodium bicarbonate. The depth of the well, apparently, is not the determining factor, as both relatively-shallow and deep wells yield soft connate-water. It is likely that the slowness of circulation of the diluting fresh-water and the connate water, resulting in a much longer contact with the base-exchange minerals, accounts for the softening. Limestone causing hardness, and the base-exchange minerals causing a natural softening, are each present in both the areas of fresh water and connate water. Rain water entering the aquifer, being highly charged with carbon dioxide, dissolves calcium carbonate and magnesium carbonate very rapidly; whereas, the base-exchange minerals act much more slowly. When all the carbon dioxide is used, solution of the carbonates apparently becomes very slow or ceases entirely. The base-exchange process, however, continues slowly. In areas of fresh water, the circulation is fast enough that little or no softening occurs. If this hard water, however, enters an area of connate water where circulation is very slow, the base-exchange process will then be much less, so that gradually all of the calcium and magnesium of the water is replaced by sodium.

Trent marl (Lower Miocene) - This formation is similar to the Castle Hayne marl in its water-bearing properties. Solution has made the semi-consolidated, sandy shellrock very porous and permeable in most places. Many wells in New Bern obtain water from the Trent marl. These wells are between 60 and 100 feet deep, have about 30 feet of casing, and are not screened or gravel-packed. Several wells have yielded 800 to 1000 gallons a minute when pumped by a suction pump, and most of them will yield several hundred gallons a minute. The 12 supply-wells at Cherry Point obtain most of their water from this formation. The average yield of the 12 wells was 310 gallons a minute with an average drawdown of 8.2 feet, which is an average specific-capacity of 38 gallons a minute per foot of drawdown. Only two of these wells have screens. Some of the water, at the New River Marine Base and at the Tent Camp south of Jacksonville, is obtained from the Trent marl. The 32 main-supply wells at these two places yield an average of more than 200 gallons a minute. Because of the fineness of the sand, however, it has been necessary to gravel-pack some of the wells at these places.

The average yield of 60 wells, listed in Bulletin 47, North Carolina

Department of Conservation and Development, is 235 gallons a minute, and the total capacity is 14,000 gallons a minute. Probably less than half of this amount is actually used. A considerable number of industrial wells at New Bern, Morehead City, Washington, and elsewhere, and domestic wells over a considerable area, withdraw water from this formation. A fair estimate of the total amount of water, withdrawn from this formation, appears to be 20 to 25 million gallons a day, which is probably less than 20 percent of the total potential-supply.

Water from the Trent marl, at nearly all places, is hard and, at some places, it has objectionable amounts of iron. Connate water probably will be encountered at depths of 200 to 500 or more feet below the surface in various places.

Yorktown Formation (Upper Miocene) - Although this formation covers a larger area than any other formation in the Coastal Plain, relatively few important supplies are obtained from it. Throughout most of the western half of the area it occupies, it is a relatively-poor acquifer and, since the depth to the underlying Cretaceous basal sand and clay strata is only 70 to 100 feet, most wells are drilled through the Yorktown formation to underlying strata. Farther east, as it becomes thicker, it becomes a better aquifer. The water is hard, however, and water from the Cretaceous deposits is still preferred. Still farther east, near the eastern edge of its outcrop, the basal Cretaceous are 500 or more feet below the surface so that wells, drilled into the Cretaceous strata, would be expensive; and, in addition, the water in them is high in chloride. Therefore, at Edenton, Plymouth and Belhaven, the wells obtain water from the Yorktown formation; at these places, the formation is thick enough so that good water-bearing strata usually will be found at some depth before encountering connate water with too high a chloride content for use.

The eight wells, listed in Bulletin 47, North Carolina Department of Conservation and Development, yield an average of 285 gallons a minute. At Edenton, the town's two gravel-packed wells yield 500 and 650 gallons a minute and a considerable number of other wells, drilled for the town and for industries, yield large amounts of water. The Plymouth city-well yields 500 gallons a minute, and other wells, at and near Plymouth, are very satisfactory. Farther south, at and around Belhaven, Aurora, and Bayboro, satisfactory yields are also obtained. However, north and east of Edenton, at the Naval Air Base four miles east of Edenton and at Hertford and Elizabeth City, the Yorktown formation appears to be less satisfactory as an aquifer. The strata, for the first 150 or 200 feet, are composed of clay and very fine argillaceous-sands from which little water can be obtained, and the small amounts, that are encountered, are rather high in chloride. Below 200 or 250 feet, better aquifers are encountered, but the water is too high in chloride for use. In this area, it has been necessary to use wells of shallow or moderate depth, 30 to 100 feet, ending in Pleistocene (Columbia Group) or Pliocene (Croatan Sand) formations.

The total capacity of the eight wells in the Yorktown formations, indicated in the preceding paragraph, is about 2,300 gallons a minute. Probably not more than 1,000 gallons a minute, or about 1,500,000 gallons a day, is actually withdrawn by these eight wells. Domestic and industrial wells, mainly in Chowan, Washington, Tyrrell, Beaufort, Hyde, Craven, and Pamlico Counties, use possibly twice as much more, which would make a total of not more than 5,000,000 gallons a day being withdrawn from the Yorktown formation. This is, obviously, only a small fraction of the total amount available.

The permeabilities of a few samples of sand from the Yorktown formation range from 25 to 650. The best aquifers, however, are the shellrock strata, and the permeabilities of these cannot be tested in the laboratory. Some of these strata, apparently, are very permeable and will transmit very large quantities of water.

The pressure head on artesian water, in the Yorktown formation, varies with the location ranging from about sea level, along the coast, to 100 or more feet above sea level near the Fall Zone. Generally, the pressure is such that the water level in wells ranges from a few feet above to 20 or 30 feet below, the surface depending upon the topographic location. Water from the Yorktown formation is generally hard and, as a rule, the shallow water is as hard as the deeper water. Water, at depth in the outer half of the Coastal Plain, usually has a high chloride-content.

Duplin Marl (Upper Miocene) - Apparently, no municipal supplies are obtained from this formation. A few wells, at the Cherry Point Marine Air Base and possibly at the New River Marine Base, draw part or all of their water from the Duplin Marl. Shallow domestic-supplies, in the areas of outcrop in Duplin, Sampson, Robeson, Bladen, and Columbus Counties and a considerable number of wells at Swansboro, Newport, Morehead City, and Beaufort, probably obtain water from the Duplin marl. The total amount of water, obtained from this formation, is very small, probably not more than a few million gallons a day. The potential yield is probably several times this amount.

Water from the Duplin marl is generally hard and, in some places, contains an objectionable amount of iron.

Waccamaw Formation and Croatan Sand (Pliocene) - Two formations, the Waccamaw and Croatan, comprise the Pliocene formations in North Carolina. The Waccamaw formation, consisting of shell marl and calcareous sands and clays, crops out only south of Neuse River, occurring in a few relatively-small areas along Cape Fear River and a larger area in Brunswick County. The Croatan sand consists of fossiliferous sand and crops out chiefly along Neuse River but has also been recognized in cuttings from wells at Cherry Point, Cape Lookout, Morehead City, Atlantic, Edenton Air Base, Harvey Point, and Elizabeth City.

Relatively few wells obtain their water from the Pliocene formations, and most of these are small domestic supplies. The wells at Harvey Point, which yield an average of 150 gallons a minute each, and the wells at Edenton Air Base furnish the most important supplies from the Croatan sand. The Patrol Plane Base and the Lend-Lease Base near Elizabeth City also obtain water from Pliocene strata which may be in the Croatan sand. The average yield, from the four wells used at these bases, is about 200 gallons a minute, and the maximum tested-yield of an individual well is 264 gallons a minute. The Croatan sand is an important aquifer in the northeastern Coastal Plain where deeper formations yield brackish water. Gravel-packed or screened wells will probably yield up to 300 gallons a minute.

The water from the Pliocene formations is, generally, moderately hard.

Columbia Group (Pleistocene) - Seven Pleistocene formations, belonging to the Columbia group, occur as a thin blanket over practically the entire Coastal Plain.

The majority of domestic ground-water supplies, and the supplies at several towns and military bases, are obtained from the Pleistocene formations. The wells at the Edenton Air Base obtain part of their water from the Pamlico formation of the Columbia Group (Pleistocene) and from the Croatan Sand formation (Pliocene).

Generally, the yield per well, from the formations of the Columbia Group, is not large, the largest probably being from wells at the Town of Manteo and

the Naval Air Station at Manteo. These wells yield 45 to 60 gallons a minute each. At most places, however, the individual yield of the wells is small, usually 5 to 15 gallons a minute. Where large supplies are desired, a considerable number of wells are drilled in a group and pumped as a unit by a section pump. The wells are finished with drive points and screens or are screened and gravel-walled. At Elizabeth City, about 150 wells, covering an area of about 0.5 square mile, yield nearly a million gallons of water a day.

It is probable that, at many places in the Coastal Plain, supplies of 500,000 to 1,000,000 gallons a day can be developed from the Pleistocene formations by using batteries of small-diameter wells.

The water from the older Pleistocene formations is usually very soft. It is low in dissolved solids but often contains objectionable amounts of iron and may be very corrosive. The water from the Pamlico Formation, however, sometimes is as hard as the deeper water of the other formations of the Columbia Group, and it also often contains objectionable iron.

Public Water Supplies - Descriptions and chemical character of public ground-water supplies, in the Coastal Plain River Basins included in this publication, are contained hereinbefore in Chapter II. No record of public surface water use, in these basins, is available.

Chemical Character of Surface Waters - The following material, taken from Bulletin 52, Volumes 1-12, inclusive, published by the North Carolina Department of Conservation and Development and prepared cooperatively by the Geological Survey, U. S. Department of the Interior, comprises analyses of samples of surface waters in Coastal Plain River Basins, collected during the period from October 1, 1944 to September 30, 1956. Samples were collected periodically at miscellaneous stream-measurement sites. Information regarding definitions and limits of tolerance, pertaining to hardness, conductivity, pH, suspended matter, color, oxygen consumed, dissolved solids, and other characteristics of quality of water, as determined by chemical analyses, may be found in the twelve volumes indicated above and also on pages 80-84, inclusive, "Water Resources of North Carolina", published by the North Carolina Department of Conservation and Development in January 1955.

Black Creek (Newport River Basin) near Newport, Carteret County

Date	5-26-50	8-19-50	9-28-50	5-24-51
Discharge (c.f.s.)	2.54	0.66	0.78	1.84
Color	90	-	-	-
pH	6.3	6.3	6.4	6.3
Specific conductance	78.1	58.7	74.7	82.2
Silica	4.1	-	-	-
Iron	0.25	-	-	-
Calcium	6.5	-	-	-
Magnesium	1.1	-	-	-
Na + K	7.2	-	-	-
Bicarbonate	17	13	21	10
Sulfate	3.6	1	2	2
Chloride	13	8.5	9.5	12
Fluoride	0.0	-	-	-
Nitrate	0.5			
Dissolved solids	65			
Total hardness	21	19	21	23

Hunters Creek (White Oak River Basin) at Kuhns, Cartaret County

Date	2-1-56	9-20-56	pH	6.0	6.1
Discharge (c.f.s.)	22.9	-	Chloride	7.0	7.7
Calcium	4.4	6.6	Nitrate	0.1	3.2
Magnesium	1.0	2.8	Hardness	15	28
Bicarbonate	10	23	Specific conductance	55.2	75.8
Sulfate	2.7	5.5			

Knobbs Creek (Pasquotank River Basin) at Elizabeth City, Pasquotank County

Date	2-24-49	9-20-49	Na + K	7.9	6.4
Color	110	90	Bicarbonate	17	22
pH	6.1	6.2	Sulfate	8.9	6.8
Specific conductance	99.5	90	Chloride	14	11
Silica	2.2	9.2	Fluoride	0.0	0.1
Iron	0.18	0.83	Nitrate	0.3	0.4
Calcium	6.5	6.3	Dissolved solids	78	82
Magnesium	2.4	2.8	Total hardness	26	27

Lockwoods Folly River (Lockwoods Folly River Basin) at Supply, Brunswick County

Date	5-14-47	Na + K	7.0
Color	75	Bicarbonate	80
pH	7.3	Sulfate	1.9
Silica	6.7	Chloride	9.0
Iron	0.10	Nitrate	0.2
Calcium	23	Dissolved solids	100
Magnesium	1.9	Total hardness	65

New Begun Creek (Pasquotank River Basin) Weeksville, Pasquotank County

Date	2-24-49	Na + K	8.7
Color	75	Bicarbonate	18
pH	6.2	Sulfate	12
Specific conductance	119	Chloride	16
Silica	1.6	Nitrate	0.1
Iron	0.04	Dissolved solids	80
Calcium	8.0	Total hardness	31
Magnesium	2.7		

New River (New River Basin) near Gum Branch, Onslow County

Date	2-2-55	8-24-55	1-27-56	7-11-56
Discharge (c.f.s.)	30	367	180	10.2
Silica	-	5.2	5.8	6.9
Iron	-	0.23	0.29	0.22
Calcium	32	7.2	12	47
Magnesium	1.5	5.3	0.3	1.7
Na + K	-	5.1	5.5	7.9
Bicarbonate	65	40	29	143
Sulfate	30	4.5	7.9	7.2
Chloride	11	5.0	7.5	8.0
Nitrate	0.2	0.6	0.6	2.0
Dissolved solids	143	53	54	151
Hardness	85	40	32	124
Specific conductance	216	99.2	98.1	272
pH	7.3	6.7	6.7	7.7
Color	-	140	45	33

New River (New River Basin) near Richlands, Onslow County

Date	6-23-49	Na + K	4.7
Color	55	Bicarbonate	81
pH	6.9	Sulfate	6.2
Specific conductance	165	Chloride	5.6
Silica	8.6	Fluoride	0.1
Iron	0.01	Nitrate	2.0
Calcium	26	Dissolved Solids	111
Magnesium	1.8	Total hardness	72

Northeast Creek (New River Basin) near Kellum, Onslow County

Date	9-20-56	Chloride	6.0
Discharge (c.f.s.)	4.02	Hardness	36
Calcium	9.2	Specific conductance	81.3
Magnesium	3.2	pH	6.3
Bicarbonate	32		
Sulfate	2.3		

Pasquotank River at Elizabeth City, Pasquotank County

Date	2-24-49	Na + K	6.4
Color	220	Bicarbonate	8
pH	5.8	Sulfate	8.2
Specific conductance	82.8	Chloride	13
Silica	5.7	Nitrate	0.3
Iron	0.51	Dissolved solids	105
Calcium	5.1	Total hardness	20
Magnesium	1.7		

Pasquotank River near Elizabeth City, Pasquotank County

Date	9-20-49	Na + K	14
Color	160	Bicarbonate	14
pH	5.7	Sulfate	7.7
Specific conductance	126	Chloride	24
Silica	7.1	Fluoride	0.2
Iron	0.77	Nitrate	0.6
Calcium	5.2	Dissolved solids	121
Magnesium	2.9	Total hardness	25

Pasquotank River near South Mills, Camden County

Date	8-12-49	4-19-50	9-4-50
Discharge (c.f.s.)	47.4	72.2	30.0
Color	720	-	-
pH	4.6	4.9	5.4
Specific conductance	66.0	60.8	85.6
Silica	13	-	-
Iron	3.4	-	-
Calcium	3.6	-	-
Magnesium	1.2		
Na + K	2.7	-	-
Bicarbonate	4	4	8
Sulfate	3.2	2	3
Chloride	9.0	9.5	12
Fluoride	0.1	-	-
Nitrate	0.2	-	-
Dissolved solids	192		
Total hardness	14	16	22

Perquimans River (Perquimans River Basin) at Belvidere, Perquimans County

Date	2-24-49	Na + K	4.7
Color	240	Bicarbonate	8
pH	5.2	Sulfate	8.1
Specific conductance	61.8	Chloride	8.5
Silica	3.4	Nitrate	0.1
Iron	0.66	Dissolved solids	95
Calcium	4.8	Total hardness	17
Magnesium	1.2		

Perquimans River at Hertford, Perquimans County

Date	2-24-49	9-20-49	Magnesium	1.8	2.2
Color	160	150	Na + K	9.4	5.3
pH	6.2	5.9	Bicarbonate	14	16
Specific conductance	93.3	78.6	Sulfate	12	6.7
Silica	5.1	7.5	Chloride	13	10
Iron	0.34	0.78	Nitrate	0.2	0.5
Calcium	5.9	5.6	Dis. solids	91	88
			Total hardness	22	23

Phelps Lake (Scuppernong River Basin) near Creswell, Washington County

Date	2-25-49	Na + K	2.8
Color	18	Bicarbonate	2
pH	5.0	Sulfate	9.5
Specific conductance	65.1	Chloride	7.9
Silica	0.7	Nitrate	2.6
Iron	0.01	Dissolved solids	51
Magnesium	1.3	Total hardness	19
Calcium	5.4		

Pinch Gut Creek (Lockwoods Folly River Basin) near Bolivia, Brunswick County

Date	5-25-50	8-18-50	5-24-51	10-1-51	11-1-51
Discharge (c.f.s.)	2.56	3.12	1.71	9.43	1.96
Color	22	-	-	-	-
pH	7.1	7.4	7.2	6.5	7.5
Specific conductance	296	243	314	101	299
Silica	11	-	-	-	-
Iron	0.16	-	-	-	-
Calcium	49	-	-	-	-
Magnesium	1.7	-	-	-	-
Na + K	7.6	-	-	-	-
Bicarbonate	157	136	181	42	173
Sulfate	2.8	2	2	1	1
Chloride	9.8	8.0	9.5	7.8	11
Nitrate	0.5	-	-	-	-
Dissolved solids	168	-	-	-	-
Total hardness	129	113	152	43	141

Pinch Gut Creek continued

Date	9-10-52	10-29-52	5-30-53	8-26-54	9-16-54	9-21-56
Discharge	2.19	3.70	0.95	0.733	1.00	0.96
Calcium	-	-	-	-	68	47
Magnesium	-	-	-	-	0.7	4.4
Bicarbonate	77	97	189	208	207	157
Sulfate	1	2	2	2	1	1.4
Chloride	8.5	9.0	10	10	10	9.0
Nitrate	-	-	-	-	0.6	2.4
Total hardness	73	86	160	175	173	133
Specific conductance	155	188	340	366	366	273
pH	7.1	7.1	7.2	7.7	7.4	7.3

Scuppernong River (Scuppernong River Basin) at Columbia, Tyrrell County

Date	2-25-49	Na + K	4.9
Color	150	Bicarbonate	10
pH	5.8	Sulfate	8.6
Specific conductance	78.3	Chloride	11
Silica	5.1	Nitrate	0.4
Iron	0.21	Dissolved solids	80
Magnesium	1.6	Total hardness	22
Calcium	6.3		

Scuppernong River at Creswell, Washington County

Date	2-25-49	Iron	0.29	Sulfate	11
Color	120	Calcium	6.3	Chloride	9.8
pH	6.0	Magnesium	3.1	Nitrate	0.3
Specific conductance	70.9	Na + K	3.2	Dis. solids	86
Silica	3.4	Bicarbonate	12	Total hardness	28

Shallotte River (Shallotte River Basin) at Shallotte, Brunswick County

Date	5-14-47	6-9-49	Bicarbonate	32	14
Color	220	120	Sulfate	20	6.3
pH	6.8	5.8	Chloride	160	26
Silica	5.3	6.6	Fluoride	0.0	0.1
Iron	0.10	0.18	Nitrate	0.2	0.3
Calcium	13	4.5	Dissolved solids	372	98
Magnesium	11	1.9	Total hardness	78	19
Na + K	89	17	Specific conductance	-	121

Southwest Creek (New River Basin) near Jacksonville, Onslow County

Date	1-31-56	9-20-56	Chloride	6.5	6.0
Discharge (c.f.s.)	43.2	1.96	Nitrate	0.1	1.6
Calcium	11	25	Hardness	30	73
Magnesium	1.0	2.8	Specific conductance	88.2	164
Bicarbonate	30	88	pH	7.0	6.8
Sulfate	5.7	2.3			

White Oak River (White Oak River Basin) at Belgrade, Onslow County

Date	4-17-50	8-19-50	5-24-41	9-10-52	10-29-52	4-28-53	2-1-56	9-20-56
Dischg. (c.f.s.)	21.1	9.85	5.11	2.36	2.56	8.00	82.6	-
Color	120	-	-	-	-	-	-	-
pH	6.3	6.8	6.7	7.1	6.9	6.5	6.2	7.0
Specific conductance	80.7	100	121	306	267	111	61.0	316
Silica	7.6	-	-	-	-	-	-	-
Iron	0.06	-	-	-	-	-	-	-
Calcium	13	-	-	-	-	-	8.1	44
Magnesium	0.9	-	-	-	-	-	0.5	10
Na + K	1.2	-	-	-	-	-	-	-
Bicarbonate	33	46	59	162	144	48	16	181
Sulfate	2.6	2	1	6	7	1	3.5	1.4
Chloride	6.2	5.5	6.0	7.0	7.5	7.2	4.5	7.0
Nitrate	0.2	-	-	-	-	-	0.1	1.3
Dissolved solids	76	46	56	-	-	-	-	-
Total hardness	36	-	-	144	127	47	22	151

CHAPTER VIII - ABATEMENT OF STREAM POLLUTION

General - The North Carolina State Stream Sanitation Committee, under the provisions of Section 143-215 of Article 21, General Statutes of North Carolina, published "White Oak River Basin Pollution Survey Report" in 1954. The area covered by this report comprises the New, Newport, North, and White Oak River Basins in Carteret, Craven, Jones, and Onslow Counties. Public hearings on the report were held at Jacksonville on June 23, 1955 and at Beaufort on June 24, 1955. The Committee assigned classifications to the waters of the four river basins on February 9, 1956. The classifications became effective on June 1, 1956. The Committee adopted a comprehensive pollution-abatement plan for the four river basins on April 30, 1957.

Sources of pollution - Significant sources of pollution are described in the report as follows:

North and Newport River Basins

Morehead City, the largest municipal source of pollution in these basins, is discharging raw sewage at two places. One-third, from a population of about 1,300, is discharged into Calico Creek which drains into Newport River. The remaining two-thirds, from a population of approximately 2,600, is discharged through multiple outlets directly into Bogue Sound.

The outfall from Lloyd A. Fry Roofing Company, which is the only significant source of industrial pollution in the four river basins covered by the pollution-survey report, is under water in Bogue Sound, making it impossible to test. After a study of the manufacturing process, it was concluded that the waste discharge was very weak.

Beaufort, like Morehead City, is discharging domestic sewage through multiple outlets on two sides of the twon. Raw sewage from a population of 600 is being discharged into Town Creek and thence to Newport River. The remaining sewage, from a population of 2,200, flows directly into Taylor Creek which is actually part of Bogue Sound.

These three sources of pollution constitute a hazard to the shellfish growing-beds and have made it necessary to condemn most of the oyster and clam growing-areas immediately adjacent to these towns. The many fish-processing plants and fishing and pleasure boats, using the harbors, dump garbage, waste, oil, and sewage into the water, thereby contributing to the serious pollution-problem in the waters adjacent to these towns.

White Oak River Basin - There is only one significant source of pollution in this drainage area. The Town of Swansboro is discharging partially-treated sewage directly into White Oak River.

New River Basin - There are four significant sources of pollution in this area. New River Marine Base and the Town of Jacksonville are discharging treated sewage directly into New River. Tarawa Terrace, also, treats its sewage and discharges it into Northeast Creek, a large tributary of New River. The Town of Richlands is discharging sewage into Mill Swamp which drains into New River. The sewage is treated through an Imhoff tank. The unsightly conditions of the stream below its effluent, however, indicate that it has been poorly operated for a long time.

Summary - There are thirteen points of significant pollution within the four river basins. New River Marine Base, which is one of the eight points indicated above, discharges treated sewage from facilities at Camp Geiger, Court-

house Bay, Onslow Beach, Rifle Range, Hadnot Point, and Mumfort Point. In Beaufort and Morehead City and their vicinity, there are several menhaden plants which are significant points of pollution. There is a waste, discharged from these plants, that has a very high oxygen-demand. The water used, in processing these fish, is taken from the waters surrounding the plants, and the liquid wastes are discharged back into the stream. In the majority of the plants, neither the water intake nor the waste discharge is measured. These waste discharges are periodic and vary in volume from time to time. It is, therefore, impossible to give an accurate estimate of the volume and concentration of the pollution from these plants.

It is a known fact that, during their operating season, these plants are a source of pollution which could be detrimental to the future propagation of fish in the surrounding waters. Appropriate steps should be taken to control the pollution from such establishments.

The wastes, from the thirteen points of significant pollution, consist of domestic sewage, industrial wastes, and a combination of both. The 1950 population of the points was 66,792, and the population served therein was 79,150. The total estimated volume of wates, discharged from these points, is 7.3 million gallons per day. The only industrial waste, of any significance within the four basins, is discharged by the Lloyd A. Fry Roofing Company and the many commercial-fishing industries. There is no practical way of estimating the volume or strength of these wastes.

The wastes from these points of significant pollution have an estimated domestic-sewage population-equivalent of 79,150.

After these wastes pass through various treatment-processes, which range from no treatment to complete treatment, the wastes, discharged to the streams, have a domestic-sewage population-equivalent of 36,625. This indicates that the total, overall waste-reduction is 53.7 %. About 10-2 % of the wastes, discharged to the streams, receive no treatment at all.

From the foregoing facts, it can be seen that more treatment is needed for the wastes. With the exception of the two communities that have no treatment, the municipalities provide good treatment. The existing domestic-sewage can be handled properly by addition of new facilities and proper operation and maintenance of existing plants. The most significant industrial-waste problem is the treatment and proper disposal of the wastes from the commercial fisheries. Municipalities and industries should obtain qualified personnel to study their waste-treatment methods and facilities.

Potential future development - The report of the State Stream Sanitation Committee sets forth potential future development in the basins as follows.

North and Newport River Basins - This area has good possibilities for water-using industries. It is probably the best section of the four basins, covered by the report, for future industrial-development because of the available labor in the towns and its easy accessibility by railroad and by large boats.

There is little possibility for extensive agricultural and dairying development because of the low and swampy characteristics of the land. Probably, the best future in this area is in commercial fishing and shellfish growing. At the present, there is extensive shellfish-growing in this area. Much more could be done, however, if better care were taken of the surface waters by the surrounding towns, communities, and industries.

There are very good possibilities for the development of resort areas in this section. The area of Atlantic Beach is well developed. Because of the sandy beaches on Bogue Banks between Atlantic Beach and Bogue Inlet, and on the Outer Banks between Beaufort Inlet and Drum Inlet, there are good possibilities for more development of this area for the tourist trade.

White Oak River Basin - This area has a good possibility for any water-using industry. Although the area is very-sparsely settled, there is plenty of labor available for any industry that wishes to build in the basin. The trend therein is moving from agriculture to industry. Its easy access to the ocean and the sound presents a good future for the fishing, shellfishing, and ship-building industries.

There are many places on the coast lines of the mainland and on the Outer Banks that could be developed into public or private bathing-beaches or sport clubs. There are great possibilities in this area to draw the fisherman, the hunter, and the tourist.

New River Basin - This area has a good future for industrial development by water-using industries. There is room for expansion of agriculture in the up-stream section of the basin where the soil is less sandy. The lumbering industry could also be expanded. Due to the large supplies of softwoods, especially pines, the pulpwood industry could be enlarged. If the waters in the area are protected from pollution, New River can be developed further for commercial fishing and shellfish propagation.

There are many locations along the river and the coast that could be developed into bathing beaches and sport clubs which would attract tourist trade.

Pasquotank River Basin

Field Investigations - The North Carolina State Stream Sanitation Committee initiated, in February 1957, a survey of water uses and sources of significant pollution in the Pasquotank River Basin. This survey was completed in April 1957, at which time sampling points were established. The stream-sampling program was concluded in October 1957, and preparation of the pollution survey report for the basin was initiated.

CHAPTER IX - WATERSHED MANAGEMENT

General - Information regarding water control; problems of watershed management; the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 2nd Session, approved August 4, 1954); and the North Carolina Soil Conservation Districts Law, enacted by the 1937 Session of the General Assembly, may be found in Chapter XIII of "Water Resources of North Carolina", published by the Department of Conservation and Development in 1955. The quoted publication comprises Volume I of 12 volumes pertaining to the water resources of the State, of which the material herein, regarding the water resources of the Coastal Plain Basins, forms Volume XII.

Soil Conservation Practices Accomplished and Contemplated - The data contained in the tables on pages 67 and 68 of "Soil Conservation Practices Accomplished" and "Soil Conservation Practices Contemplated" were furnished by the State Conservationist, Soil Conservation Service, U. S. Department of Agriculture, Raleigh, North Carolina, for the thirteen counties lying wholly or partially within the Coastal Plains River Basins.

Dare County, for which no data is available, is not included in any of the 37 North Carolina Soil Conservation Districts. Camden, Currituck, Pasquotank, and Perquimans Counties are four of the five counties in Albemarle District. Brunswick County is one of the five counties in Lower Cape Fear District. Carteret, Craven, Jones, and Onslow Counties are four of the five counties in Lower Neuse District. Hyde, Tyrrell, and Washington Counties are three of the four counties in Pamlico District.

The records of the State Conservationist are maintained on a district, and on a county, basis. Consequently, when a county lies in two or more basins, it was necessary for the State Conservationist to use estimates instead of actual accomplishments. He feels sure, however, that the figures of the two tables are accurate enough for all practical purposes.

The large number of district cooperators, shown on the table of "Soil Conservation Practices Contemplated", does not necessarily signify an unwillingness on the part of farmers to carry out Soil Conservation plans. On the other hand, it simply means that the small number of Soil Conservation Service technicians in North Carolina have been unable thus far to work with all of these farmers. The State Conservationist hopes to reach them all as rapidly as possible.

Deep Creek Watershed - The following information has been taken from the field examination report, dated May 21, 1957, for Deep Creek Watershed, Washington County, prepared by the State Conservationist, Soil Conservation Service, as a result of an application for planning assistance under the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, approved August 4, 1954). Deep Creek rises in Washington County about five miles northeast of the Town of Roper and flows northeasterly and easterly, approximately parallel to the course of Scuppernong River, to its confluence with Bull Bay, an arm of Albemarle Sound, about five miles northeast of the Town of Creswell. The watershed is bounded on the north by Albemarle Sound, on the east and south by the Scuppernong River Basin, and on the west by Mackeys Creek Watershed.

Topography and Geology - The entire area is very flat and less than 10 feet above sea level. All of the watershed is on the Pamlico Terrace, one of the seven formations of the Columbia Group. Information regarding the Pamlico Terrace may be found hereinbefore under Columbia Group (Pleistocene) in Chapter VI of this publication.

SOIL CONSERVATION PRACTICES ACCOMPLISHED

ITEM	UNIT	BRUNSWICK	CAMDEN & PASQUOTANK	CARTERET	CRAVEN	CURRITUCK*	HYDE
Closed Drains	L.Ft.	29,596	9,575	72,554	7,281	18,077	-
Conservation Crop Rotation	Acres	2,681	14,472	7,198	3,516	9,131	23,720
Contour Farming	Acres	14	0	355	27	0	-
Contour Strip Cropping	Acres	0	0	30	2	0	-
Cover Cropping	Acres	1,361	8,262	5,466	3,094	3,100	1,817
Critical Area Planting	Acres	0	0	82	30	0	-
Crop Residue Utilization	Acres	1,101	47,882	12,933	3,238	27,771	21,000
Drainage	Acres	1,725	47,145	11,794	1,376	42,834	24,291
Improvement Cutting	Acres	4,837	918	11,882	1,403	930	40
Open Drains	Miles	37	1,094	19	26	685	730
Open Drains	Cu.Yds.	265,447	1,618,346	102,887	166,878	2,093,188	1931,898
Pasture Planting	Acres	655	2,659	4,172	387	3,183	1,130
Pond Construction	No.	21	29	10	10	29	4
Sprinkler Irrigation Syst.	No.	0	8	10	2	5	-
Sprinkler Irrigation Syst.	Acres	0	84	482	40	80	-
Terracing	Miles	0.3	0	0	1	0	-
Tree Planting	Acres	4	37	29	72	2	10
Waterway Development	Acres	1	0	6	1	0	-
Wildlife Area Improvement	Acres	35	135	59	31	5,218	26
District Cooperators	No.	419	783	422	84	504	478

* No data available on Dare County

SOIL CONSERVATION PRACTICES ACCOMPLISHED (Continued)

ITEM	UNIT	JONES	ONSLOW	PERQUIMANS	TYRRELL	WASHINGTON	TOTAL
Closed Drains	L.Ft.	55,846	222,065	250	-	46,581	461,825
Conservation Crop Rotation	Acres	3,038	13,678	6,723	0	25,414	109,571
Contour Farming	Acres	846	1,745	2	-	0	2,989
Contour Strip Cropping	Acres	730	18	0	-	-	780
Cover Cropping	Acres	4,041	7,147	5,592	0	6,699	46,579
Critical Area Planting	Acres	101	553	10	-	-	776
Crop Residue Utilization	Acres	10,681	6,334	17,675	0	4,652	153,267
Drainage	Acres	1,427	10,022	19,683	7,736	29,992	198,025
Improvement Cutting	Acres	1,854	6,974	310	2,746	13,108	45,002
Open Drains	Miles	46	113	493	317	645	4,205
Open Drains	Cu.Yds.	276,361	435,442	1,063,579	408,236	3,225,000	11,587,262
Pasture Planting	Acres	658	2,685	2,574	1,576	4,368	24,038
Pond Construction	No.	13	28	9	0	34	187
Sprinkler Irrigation Syst.	No.	2	5	2	1	-	35
Sprinkler Irrigation Syst.	Acres	43	72	19	36	-	856
Terracing	Miles	3	41	0	-	-	45.3
Tree Planting	Acres	34	29	14	-	314	545
Waterway Development	Acres	6	67	0	-	-	81
Wildlife Area Improvement	Acres	53	20	72	5	26	5,680
District Cooperators	No.	445	581	653	280	566	5,215

SOIL CONSERVATION PRACTICES CONTEMPLATED

ITEM	UNIT	BRUNSWICK	CAMDEN & PASQUOTANK	CARTERET	CRAVEN	CURRITUCK *	HYDE
Closed Drains	L.Ft.	124,903	831,975	1,379,446	83,719	10,148	-
Conservation Crop Rotation	Acres	15,081	65,900	20,982	3,199	31,089	12,084
Contour Farming	Acres	6,829	0	2,965	1,836	0	-
Contour Strip Cropping	Acres	214	0	650	345	0	-
Cover Cropping	Acres	7,284	8,840	22,714	3,621	400	9,048
Critical Area Planting	Acres	30	0	718	490	0	-
Crop Residue Utilization	Acres	4,794	21,279	15,247	3,377	11,990	11,700
Drainage	Acres	4,590	38,251	22,518	4,947	10,244	17,473
Improvement Cutting	Acres	62,983	8,182	153,062	27,978	14,070	9,073
Open Drains	Miles	72	833	197	114	200	892
Open Drains	Cu.Yds.	276,468	925,279	1,041,744	647,770	199,904	4,460,000
Pasture Planting	Acres	2,039	2,374	20,424	2,077	503	3,966
Pond Construction	No.	10	13	6	17	20	20
Sprinkler Irrigation Syst.	No.	15	100	14	3	8	-
Sprinkler Irrigation Syst.	Acres	150	1,956	8,750	10	180	-
Terracing	Miles	11	0	32	29	0	-
Tree Planting	Acres	416	540	71	953	401	990
Waterway Development	Acres	19	0	26	38	0	-
Wildlife Area Improvement	Acres	252	202	186	80	6,626	124
District Cooperators	No.	525	465	192	151	38	208

* No data available on Dare County

SOIL CONSERVATION PRACTICES CONTEMPLATED (Continued)

ITEM	UNIT	JONES	ONSLOW	PERQUIMANS	TYRRELL	WASHINGTON	TOTAL
Closed Drains	L.Ft.	1800,598	9694,615	69,250	-	335,619	14,330,273
Conservation Crop Rotation	Acres	14,380	83,697	43,088	13,298	4,334	307,132
Contour Farming	Acres	2,721	26,883	-	-	294	41,528
Contour Strip Cropping	Acres	2,837	902	0	-	-	4,948
Cover Cropping	Acres	13,369	90,227	19,313	5,771	19,014	199,601
Critical Area Planting	Acres	859	3,007	-	-	-	5,104
Crop Residue Utilization	Acres	6,138	91,040	32,136	10,692	12,074	220,467
Drainage	Acres	10,457	42,970	31,508	5,440	692	189,090
Improvement Cutting	Acres	21,372	180,554	19,890	7,977	17,969	523,110
Open Drains	Miles	175	1,095	925	467	438	5,408
Open Drains	Cu.Yds.	848,429	4790,158	4625,000	1906,350	2190,000	21,911,102
Pasture Planting	Acres	3,131	9,134	1,432	639	4,452	50,171
Pond Construction	No.	20	28	9	0	185	328
Sprinkler Irrigation Syst.	No.	38	354	15	11	-	558
Sprinkler Irrigation Syst.	Acres	357	3,516	321	300	-	15,540
Terracing	Miles	3	241	0	-	-	316
Tree Planting	Acres	80	1,531	9	-	137	5,128
Waterway Development	Acres	58	249	-	-	-	390
Wildlife Area Improvement	Acres	298	442	65	100	261	8,636
District Cooperators	No.	1,159	1,598	308	298	282	5,224

Soils and Erosion - Portsmouth, Bladen, Bayboro, Elkton, Lenoir, and Dunbar are the soil series of the higher portions of the watershed. Soils in the lower area are of the Johnston series and alluvial soils, undifferentiated.

Wind erosion is a problem on the larger, sandier areas where cover and windbreaks are inadequate. A few areas of sloping land are subject to sheet erosion, and some erosion occurs along road ditches.

Watershed Problems - These problems comprise floodwater and sediment damage, erosion damage, and forestry.

Floodwater and Sediment Damage - Over a considerable period of years, the channel of Deep Creek has become filled with silt, debris, and vegetation. With no channel to carry the water, it has spread out over the broad, flat area adjacent to the stream. These conditions have developed a wide expanse of swamp, very poorly drained and covered with a dense growth of hardwoods.

The elevation of the farmland is approximately 6 to 8 feet above sea level. This elevation is insufficient to provide adequate drainage where the swamp fills with floodwater.

Since the seasons of excessive rainfall coincide with the seasons of planting and harvesting crops, these two operations are often delayed with resulting lower-yields and loss of mature crops.

Sediment is deposited in the channels, especially in the headwaters, with every heavy rain. Most of the sediment is fine and contains a high percentage of organic matter.

Erosion Damage - Erosion damage is relatively low on the cropland of the watershed. A few sloping-fields are losing some fine-grained material. Field and highway ditches show more evidence of erosion and are the main source of the sediment that is being deposited in the larger drainways.

Forestry Improvement - The hardwood species, now growing in the lowland areas, grow slowly because the water stands on the land for long periods of time. Proper drainage would increase the growth of desirable species such as poplar and red gum. On the higher areas, with proper drainage, pine could be established.

Project Objectives - These objectives include (1) application of land-treatment measures to the cropland to insure sustained production and to protect it from erosion, (2) reduction of floodwater damages to cropland and woods, (3) opening of channels with sufficient depth and capacity to provide adequate drainage of the agricultural lands of the watershed, and (4) improvement of health conditions by reduction of the population of insects, especially mosquitoes.

Land Treatment - Land-treatment measures, most needed to assure success of the project, include (1) crop rotations to meet land-capability requirements, (2) cover crops, (3) farm drainage, and (4) forestry improvement through plantings and stand improvements.

At the present time, more than 50 percent of the farmers in the watershed have soil and water conservation-plans on their farms. Many of the remaining farmers have requested assistance in their agricultural water-management problems.

Floodwater and Drainage Measures - Approximately 11 miles of channels will need to be opened to sufficient depth and width to reduce flooding and to provide

adequate outlets for farm drainage.

Farmers throughout the watershed have installed farm-drainage ditches on all cropland. These ditches, although not adequate, are about as good as can be expected until the main drainage-ways have been improved.

Landowners, at the present time, are in the process of setting up a drainage district. A lawyer has been employed, and the proposed district is being organized as rapidly as due course of law will permit.

Effects of the Project outside of the Watershed - Health conditions throughout the area will be improved by reduction of the mosquito population. Economic conditions of the surrounding area will be improved by the higher income of the farmers as it is reflected in increased buying-power.

Estimated time to Complete the Project - It is estimated that the project can be completed in three years. Land-treatment measures are well advanced and should be completed within the time required to install structural works of improvement.

CHAPTER X - NAVIGATION AND FLOOD CONTROL

The following information has been taken from "Water Resources Development by the U. S. Army Corps of Engineers in North Carolina", published by the South Atlantic Division, Corps of Engineers, U. S. Army, Atlanta, Georgia, and dated January 1, 1957.

Atlantic Intracoastal Waterway between Norfolk, Virginia, and the St. Johns River, Florida (Wilmington District) - This waterway is a sea-level route through coastal sounds and marine marshes, approximately paralleling the Atlantic Coast between Norfolk, Virginia, and the St. Johns River, Florida.

Two routes are available from Norfolk to Albemarle Sound, the Albemarle and Chesapeake Canal route and the Dismal Swamp Canal route. The Albemarle and Chesapeake Canal route comprises a land cut in Virginia between Norfolk and North Landing River, channels in North Landing River and Currituck Sound, a land cut between Currituck Sound and North River, and channels in North River and Albemarle Sound, all maintained at a depth of 12 feet. The Dismal Swamp Canal route comprises a canal between Norfolk and Pasquotank River (known in North Carolina as Lake Drummond Canal) and channels in Pasquotank River and Albemarle Sound, maintained at a depth of 9 feet.

The Atlantic Intracoastal Waterway in North Carolina includes, in addition to the land cuts, channels, and canal indicated above, a channel in Alligator River; a land cut between Alligator River and Pungo River; channels in Pungo River, Pamlico River, and Goose Creek extending along the Beaufort-Pamlico County line; a land cut between Goose Creek and Gale Creek (Pamlico County); channels in Gale Creek Bay River, Pamlico Sound, Neuse River, and Adams Creek (Craven County); a land cut between Adams Creek and Core Creek (Carteret County); channels in Core Creek, Newport River, Bogue Sound, and White Oak River (extending along the Onslow-Carteret County line); channels through coastal sounds and marine marshes from White Oak River to the southern end of Myrtle Sound; a land cut (known as Snows Cut) between Myrtle Sound and Cape Fear River; a channel in Cape Fear River between Snows Cut and Southport (Brunswick County); and channels, through coastal sounds and marine marshes, from Southport to Little River, South Carolina, near the North Carolina-South Carolina State line. All of these channels are maintained at a depth of 12 feet except the channel in the Cape Fear River, the depth of which was recently increased from 32 feet to 34 feet.

By the Albemarle and Chesapeake Canal route, the project provides for the following features:

(a) A waterway 12 feet deep, with widths varying from 90 feet in land cuts to 300 feet in open waters;
(b) Construction, operation, and maintenance of suitable bridges (Coinjock, Core Creek, Fairfield, Hobucken, and Wilkerson Creek bridges);
(c) A tidal lock in Snows Cut near Cape Fear River;
(d) A channel, 12 feet deep and 90 feet wide, in New River between the Intracoastal Waterway and the Atlantic Coast Line Railroad bridge at Jacksonville (21 miles) and a basin at Jacksonville;
(e) A side channel, 12 feet deep and 90 feet wide, to a turning basin, 200 feet by 350 feet, at Swansboro;
(f) An entrance channel, 6 feet deep and 90 feet wide, at New River Inlet;
(g) Six mooring basins at various locations along the waterway;
(h) A channel, 14 feet deep and 400 feet wide, across the ocean bar at Masonboro Inlet and thence, 12 feet deep and 90 feet wide, to the Intracoastal Waterway at Wrightsville via Banks and Motte Channels;

(i) A jetty on each side of Masonboro Inlet extending to the 14-foot contour in the ocean;

(j) A turning basin, 15 feet deep and 300 feet by 700 feet, on the east side of Banks Channel near Masonboro Inlet;

(k) A boat basin, 12 feet deep and 230 feet by 450 feet, at Southport;

(l) Salt-water-intrusion preventive measures and improvement of drainage in the vicinity of Fairfield (Hyde County) by construction of a dam and pumping plant, and improvements in other canals in the area; and

(m) A side channel, 12 feet deep, 90 feet wide, and about 1,850 feet long, extending from the 12-foot depth in the Intracoastal Waterway in Bogue Sound into Peltier Creek, about 4 miles west of Morehead City, with a basin, 12 feet deep, 200 feet wide, and 600 feet long, at the inner end.

The existing project, set forth above in (a) to (m), inclusive, is about 98 percent completed. Total costs to date have been about $9,622,000 for new work.

Plans have been completed for dredging Masonboro and Connecting Channels, and for providing salt-water-intrusion preventive measures in the vicinity of Fairfield.

The jetties at Masonboro Inlet are to be constructed when and if found to be necessary. No work has been done on providing a tidal lock in Snows Cut, six mooring basins in the waterway, and the side channel to, and basin in, Peltier Creek.

The average annual-commerce on the section of this waterway in the Wilmington District, during the period 1951-1955, was 1,578,000 tons, consisting of petroleum products, logs and pulpwood, fish and shellfish, and various other commodities. Commerce totaled about 1,827,000 tons in 1955. This waterway served as a vital artery for transportation during the recent war. Pleasure craft make extensive use of the water.

An investigation, to determine the advisability of deepening the existing 9-foot channel from Albemarle Sound to Elizabeth City via Pasquotank River so that small tankers and freighters, operating on the 12-foot channels of the Intracoastal Waterway, could make deliveries to Elizabeth City, was scheduled to be completed in 1957.

The date of completion of the investigation, to determine the advisability of measures to provide adequate drainage and protect farm and timber lands affected directly by the Intracoastal Waterway between Albemarle Sound and Pungo River, including the channel in Alligator River, was indefinite as of January 1, 1957.

Knobbs Creek (Pasquotank County) - This navigation project provides a channel, 10 feet deep at mean low water, from that depth in Pasquotank River to the Norfolk Southern Railway in Elizabeth City, 100 feet wide in Pasquotank River and generally 60 feet wide in Knobbs Creek, with a turning basin in the bend in the creek downstream from the bridge. The project was completed at a cost of $80,500.

The average annual-commerce for the period 1951-1955 was about 20,500 tons, and the commerce in 1955 was 4,139 tons. The chief commodities handled were logs and petroleum products.

Morehead City Harbor - The present project provides for a channel, 30 feet deep and 100 feet wide, across the ocean bar at Beaufort Inlet, and thence, 30 feet deep and 300 feet wide, to the terminals at Morehead City at which point the width of the 30-foot channel is enlarged to 600 feet to form a turning basin; for a channel, 12 feet deep and 100 feet wide, from the 30-foot channel to Sixth Street, Morehead

City, and thence, 12 feet deep and 200 to 400 feet wide, to Tenth Street; and for a channel, 6 feet deep and 75 feet wide, from the 12-foot channel to deep water in Bogue Sound.

The 12-foot and 6-foot channels were completed in 1931, and the 30-foot channel was completed in 1936. Costs of new work have been $657,600.

The commerce for the period 1951-1955 averaged about 457,000 tons annually, principally petroleum products. In 1955, commerce totaled about 447,000 tons. In view of the recent construction of modern port-facilities at Morehead City Harbor by the North Carolina State Ports Authority, it is anticipated that the annual commerce of the port will increase considerably. (Tonnages of tobacco exports increased from 10,477 in 1956 to 15,162 in 1957. The Southern Railway System purchased control of the Atlantic and East Coast Railway in September 1957 and thereby provided the port of Morehead City with a through east-west trunk line by a major carrier. During 1957, 58 dry-cargo ships called at the port - an increase of 21 over 1956.)

The Secretary of the Army, on June 10, 1955, submitted to Congress the report of the Chief of Engineers in accordance with a resolution of the Committee on Public Works of the United States Senate, adopted on July 1, 1949. The resolution requested the Board of Engineers for Rivers and Harbors to review the prior reports on Morehead City Harbor with a view to determining whether any modification of the project was advisable, particularly with a view to enlarging the turning basin and to providing increased depths to at least 35 feet, mean low water, in the basin and in the present 30-foot channel. The Chief of Engineers indicated, in his report, his concurrence in the views and recommendations of the Board of Engineers for Rivers and Harbors.

The Board recommended that the existing project for Morehead City Harbor be modified to provide as follows:

(1) A channel across the ocean bar at Beaufort Inlet, 35 feet deep and 400 feet wide, increased to 600 feet at the bend;

(2) An inner channel, 35 feet deep and 300 feet wide, realined to maintain or decrease the slope of the underwater bank along the northeasterly shore of Fort Macon Point; and

(3) An enlarged turning-basin deepened to 35 feet, to be obtained by lengthening the westerly leg about 800 feet and widening the throat and the easterly leg, with the boundaries to be not closer than 50 feet to any bulkhead, wharf, or pier.

The Board recommended that the above modification of the project be constructed generally in accordance with the plan of the District Engineer, Wilmington District, and with such modifications of the plan as, in the discretion of the Chief of Engineers, may be advisable. The cost to the United States for construction, and for maintenance in addition to that now required, was estimated by the Board to be $1,197,000 and $10,000 annually, respectively. The Board recommended that local interests be required to (a) furnish, free of cost to the United States, all lands, easements, rights-of-way, and suitable spoil-disposal areas required for initial work and for subsequent maintenance when and as required; (b) provide and maintain adequate terminal and transfer facilities, open to all on equal terms; and (c) hold and save the United States free from damages due to construction and maintenance of the project.

This project was included in the 1956 Public Works Authorization Act which was vetoed by the President of the United States, in the 1957 Public Works Authorization Bill which was passed by the United States Senate but did not reach the

floor of the House of Representatives, and in the 1958 Public Works Authorization Act which was vetoed by the President. It was included in the revised version of a new 1958 Public Works Authorization Bill which was agreed upon by a Senate-House Conference Committee on June 24, 1958 and was sent to the Senate and House for further action. The bill was enacted into law, and the act was approved by the President.

New Begun Creek - This creek rises in Pasquotank County and flows east about 5 miles to its confluence with Pasquotank River about five miles above the confluence of Pasquotank River with Albemarle Sound. The project provides for a channel, 5 feet deep, with a minimum width of 40 feet over the bar at the confluence of the creek and the river. The channel has a length of about 3,000 feet. It was completed in 1920 at a cost of about $4,800.

No commerce has been reported on New Begun Creek in recent years.

Perquimans River (Perquimans County) - This project provides for a channel, 1000 feet long, 200 feet wide, and 9 feet deep, through a reach 800 feet below Hertford, about 13 miles above the confluence of the river with Albemarle Sound. The project was completed in 1910 at a cost of about $13,800.

The average tonnage of commodities, moving over this waterway during the period 1951-1955, was 7,500 tons, principally petroleum products. About 6,400 tons were transported through the channel in 1955.

The approximate date of an investigation, to determine the feasibility of providing flood control and drainage improvements on the river, was indefinite as of January 1, 1957.

Scuppernong River (Washington and Tyrrell Counties) - This project consists of a shallow-draft channel from the confluence of the river with Bull Bay, an arm of Albemarle Sound, about 4.5 miles northwest of Columbia (Tyrrell County) to Cherry (Washington County) about 3.5 miles north of Lake Phelps. The distance of the project is 19.6 river-miles. The project provides for a channel from Bull Bay, 10 feet deep and 150 feet wide over the bar in the bay and 10 feet deep and 100 feet wide in the river, to Columbia; a channel, 8 feet deep and 40 feet wide, from Columbia to Spruills Bridge near Creswell (Washington County) including six cut-offs; a channel 7 feet deep and 30 feet wide, from Spruills Bridge to a Washington County highway bridge near Cherry; and a triangular turning-basin, 7 feet deep by 150 feet on each side of the basin, near the highway bridge which is located at the confluence of Scuppernong River and Mauls Creek. The project was completed in 1925 at a cost of about $81,200.

Water-borne commerce, principally petroleum products and gravel, averaged about 40,550 tons annually in the period 1951-1955. Only about 5,700 tons were transported in 1955 due to the fact that the amount of sand and gravel decreased from 28,000 tons in 1953 to 3,000 tons in 1954.

Shallotte River - The mouth of this river at the Atlantic Ocean is in Brunswick County, about 20 miles west of the mouth of Cape Fear River. The project provides for a channel, 4 feet deep and 36 feet wide, from the mouth to the Town of Shallotte, 9 miles above. The improvement was completed in 1929 at a cost of about $15,200. Average annual water-borne traffic on this waterway, in the period 1951 - 1955, was 260 tons, principally seafood. In 1955, commerce totaled 310 tons.

The approximate date of completion of an investigation of requests for a deeper channel, over the ocean bar and in the river, was indefinite as of January 1, 1957.

Holden Beach (Lockwoods Folly Inlet), Brunswick County - A preliminary-examination report, on the advisability of providing a boat basin at Holden Beach and improvements of Lockwood Folly Inlet for navigation and beach erosion, was submitted by the District Engineer to the Chief of Engineers in 1955. The report concluded that provision of a basin at Holden Beach or a deeper channel, with or without jetties, from the Atlantic Ocean through Lockwoods Folly Inlet to the Atlantic Intracoastal Waterway, singly or in combination, did not appear to be economically justified at that time, and recommended that no survey of the project be made. A re-examination of the report has been authorized in view of the fact that local interests are prepared to submit benefits additional to those considered in the preliminary-examination report.